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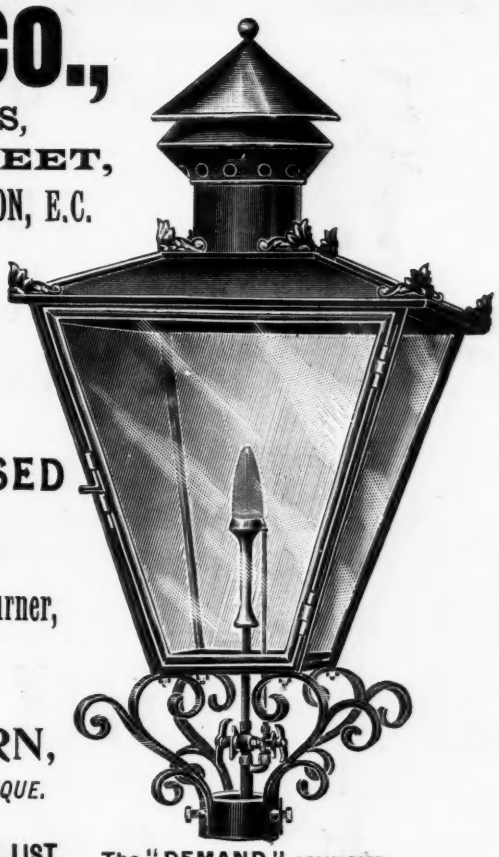

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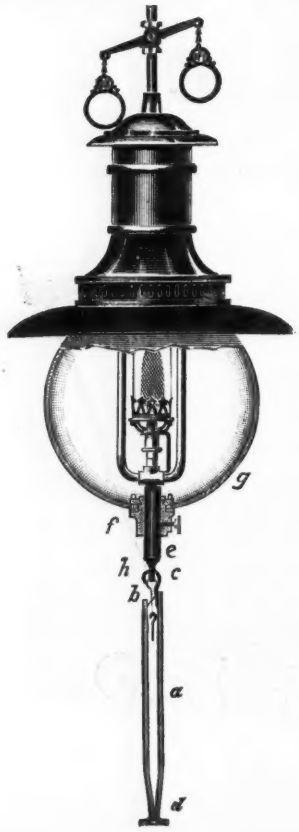

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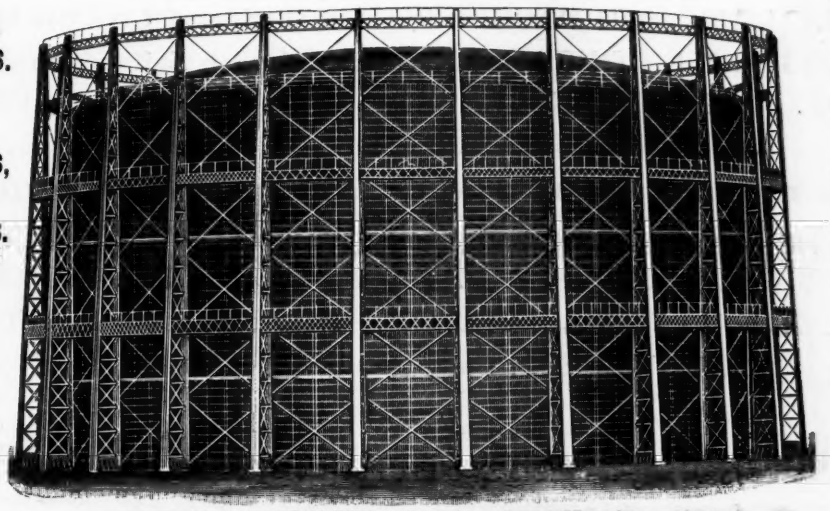

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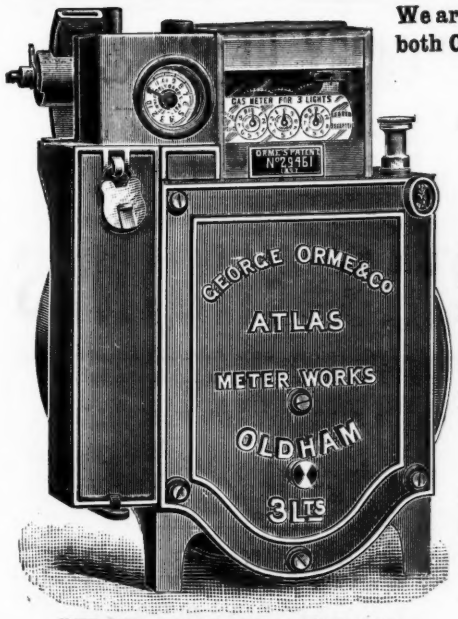

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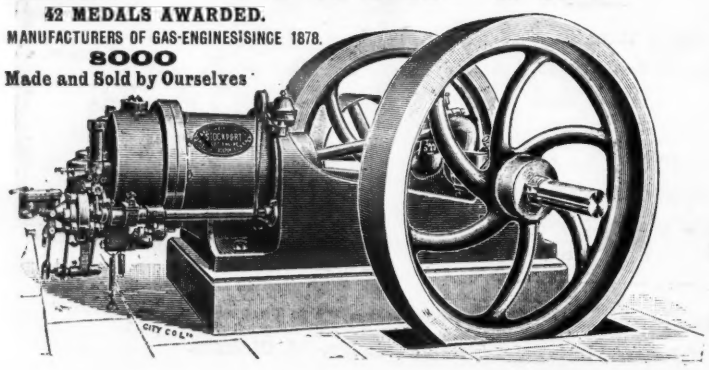

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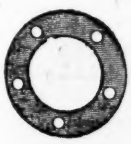

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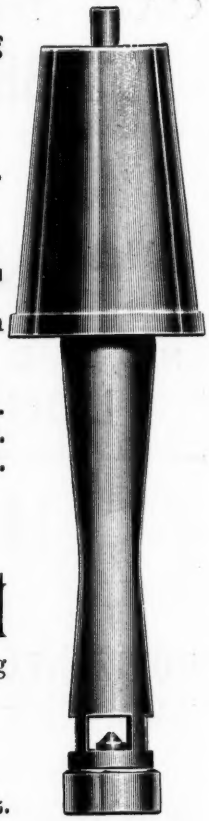

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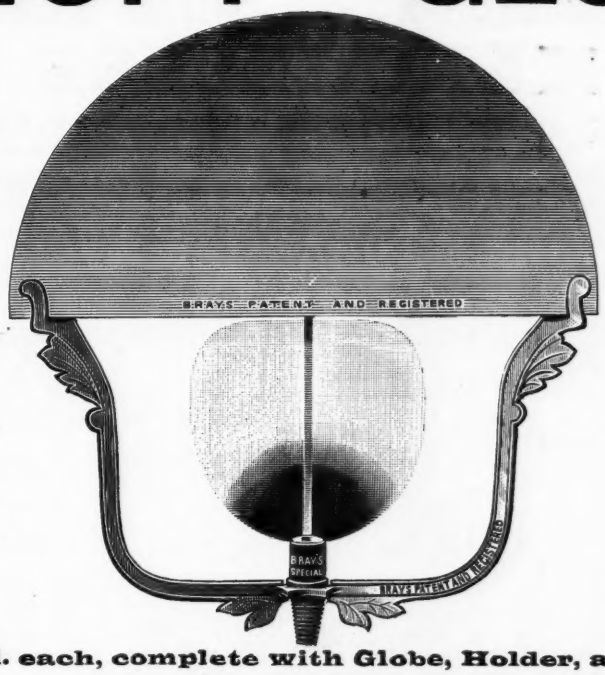

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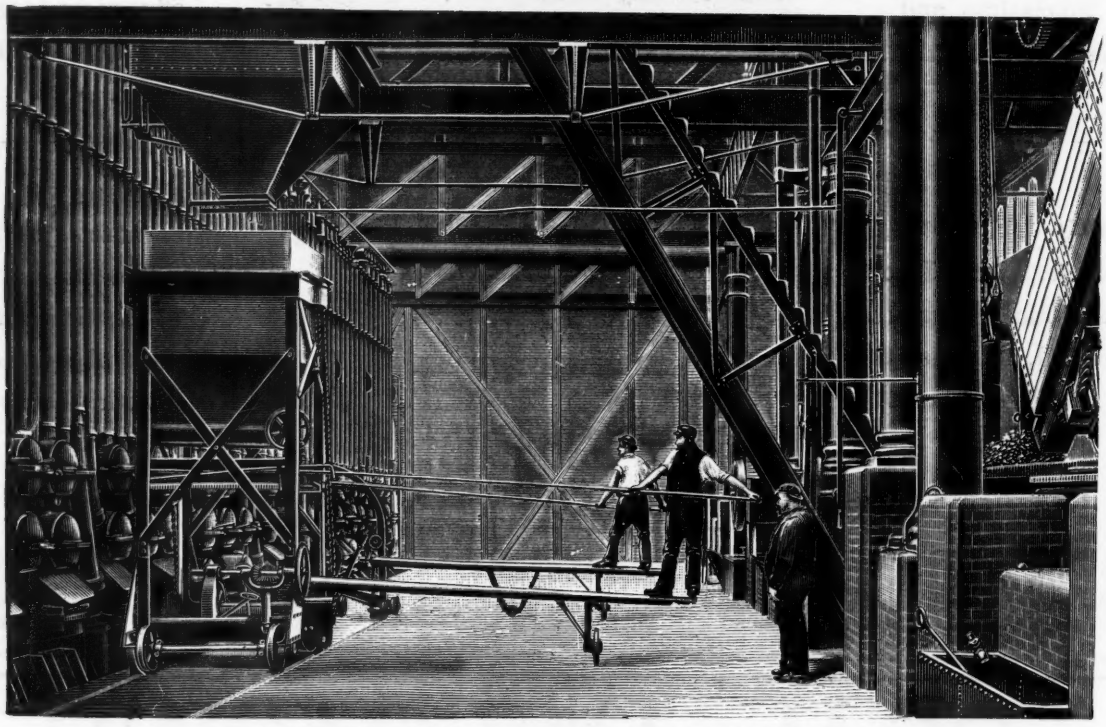

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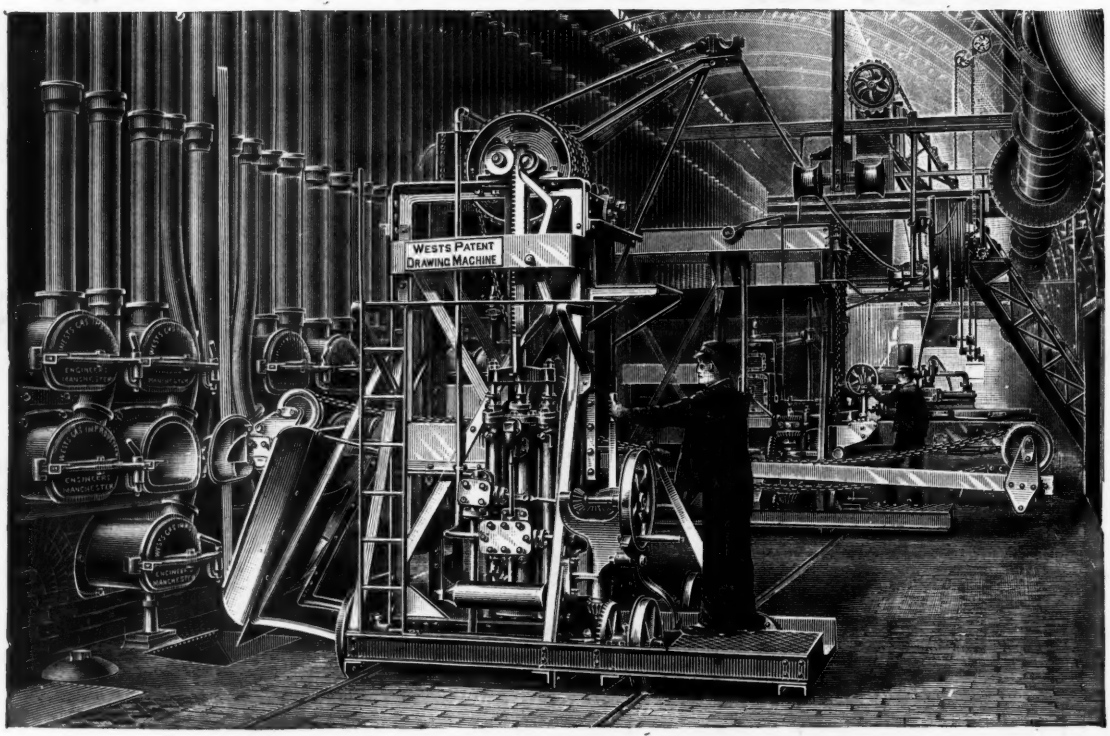

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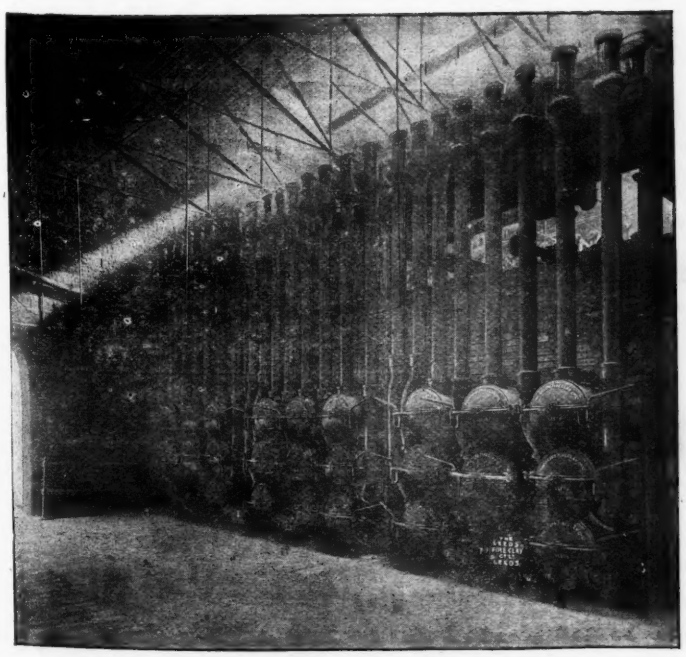

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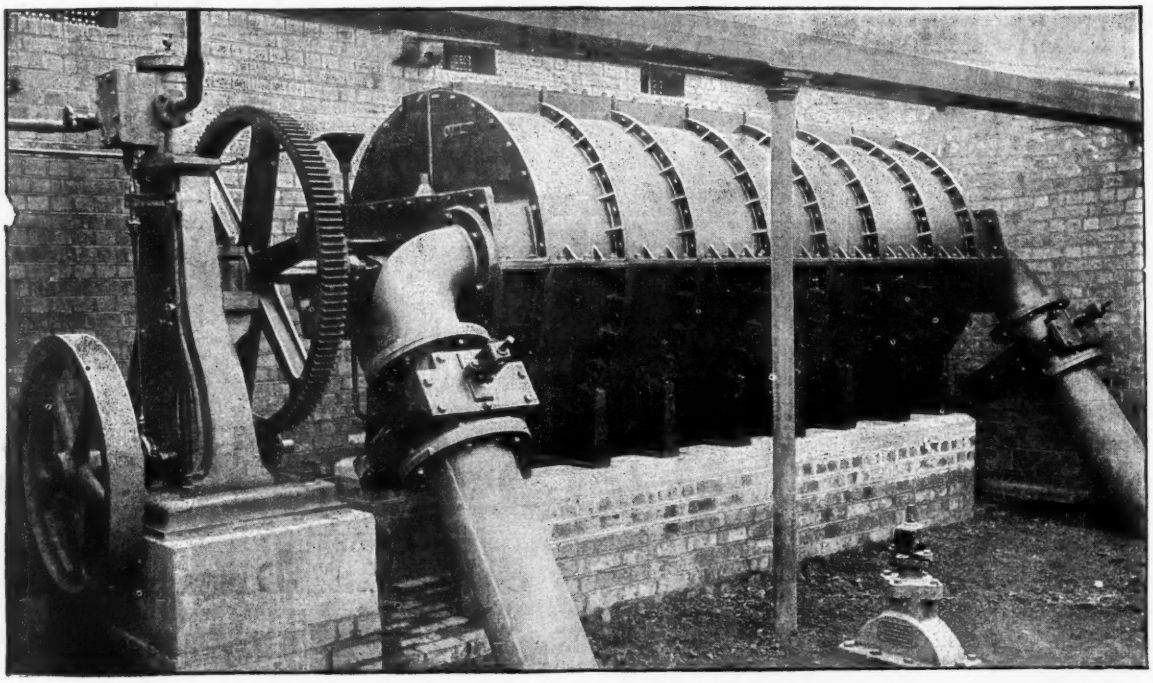

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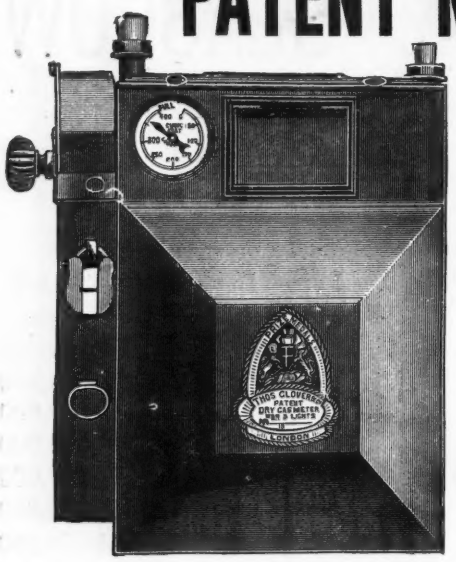

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EDITORIAL NOTES.

Parliament and the London County Council on the Gas Supply of London.

THE gas supply of London has been discussed during the past week by high authorities duly qualified for criticizing it in a responsible manner—the London County Council and the House of Commons. The subject was brought before the County Council last Tuesday, as provided by the Borough Funds Act, upon the question whether opposition should be offered to The Gaslight and Coke Company's Bill now before Parliament. It was a singular coincidence that on the same day the order for the second reading of the Bill had been reached in the House of Commons; and although the motion was opposed, it was carried without a division. For this reason, some members of the Council urged that further opposition to the Bill would be waste of time and money, inasmuch as the only good ground for such opposition is not touched by the proposals of the measure. The objection is a perfectly valid one; and it cannot be imagined that any action the Council may take in the circumstances will have the smallest effect. Nevertheless, the Council decided to oppose the Bill, for reasons that were bound to influence them to this resolve. The Company are intensely unpopular, on account of the high price of gas in North as compared with South London. The explanations of, and the excuses for, this state of things advanced by the Horseferry Road authorities do not command the slightest respect outside the Company's own building. The County Council see in the Company's Bill a provision for the continuance of the actual condition of affairs for a further twenty years; and they do not like the prospect. Whether or not they can get at the Company, through the Bill, may be doubtful; but at any rate they mean to try.

Parliament has undertaken the task of overhauling the London gas supply in another way. Mr. Cohen, M.P., who is also a member of the County Council, moved for the appointment of a Select Committee to inquire into the powers of charge possessed by the London Gas Companies; and Mr. Pickersgill, with more energy than tact, sought to amend the proposal of his colleague. This amendment had the effect of making Mr. Cohen's an opposed measure, and, as such, of bringing it under the well-known rule which has killed so many parliamentary projects. Perceiving the danger, however, Mr. Pickersgill sacrificed his amendment; and accordingly Mr. Cohen got his Committee. It is difficult to see how the investigation of the subject in the way proposed can be anything but academical. The London Gas Companies are as Parliament has made them; and all the legislative enactments in the world cannot do more than frame constitutions—they are not able to touch the quality of administration and management. Still, the proceedings of the Committee are likely to be interesting.

A Check to Municipal Arrogance.

AN illustration of Municipalism in practice was mentioned in the "JOURNAL" of April 26 last, when we noticed in the "Electric Lighting Memoranda" that the St. Pancras Vestry had evinced a propensity for using their powers as the Highway Authority to the disadvantage of the Gas Company and the undue favouring of their electric lighting undertaking. Thanks to the courtesy of Messrs. Bedford, Monier-Williams, and Robinson (the Solicitors for The Gaslight and Coke Company), we are now able to give the continuation and sequel of this municipal development. The difficulty between the Vestry and the Company was referred to arbitration by the Board of Trade, and accordingly Major-General Scrope Hutchinson, R.E., sat as sole Arbitrator at the Vestry Hall last November, to determine two questions. These were, practically, whether the Vestry should be allowed to dictate to the Company the location of new gas-mains; and whether, in giving their consent to the breaking up of a street for such a purpose, the Vestry could attach to the sanction a condition that dead mains were to be removed. In form, the Company's application to the Board of Trade was for dispensing with the consent of the Vestry to the laying of certain proposed mains. The mains in question were a pair of 4-inch service-mains, which the Company wished to lay under the pavements on the two sides of College Place, St. Pancras. The old main was a 2-inch one, laid in the roadway, where the Company proposed to leave it. On the face of it, the Company's

plan for improving the gas distribution was good and reasonable; and ordinarily the Local Authority would have approved it.

Before the particular application in question, the Vestry had never attempted to control the location of gas-mains; but the fact of their being in possession of electric lighting powers over the locality, led them to adopt a new line of policy in this regard. They formed the resolve to keep the footways sacred to their electricity department; and in order to secure this reservation, they only consented to the laying of the new mains in College Place in the line of the old one. The ingenuity that worked in a plausible complaint of the "objectionable practice," from the point of view of the public safety, of leaving dead mains in the public roadways, with the special desire for the monopoly of the footways, is to be admired. In contesting the asserted right of the Vestry to control the location of the Gas Company's mains, Mr. Claude Baggallay, Q.C., relied in the first place upon the principle of law that upset the Battersea Vestry recently—that the Local Authority have no property in the subsoil of streets, and have power only over the road surface. This means that the interest of the Highway Authority is limited to the surface of the roads, and their powers can only be exercised in the interests of wayfarers. Mr. Corrie Grant, for the Vestry, could not keep the electric lighting interest out of the question. He likewise quibbled over the point as to whether the term "roadway" includes the footpaths, and several other legal questions of the same kind. The Arbitrator's award makes short work of the whole affair; and the end of it is that the Board of Trade have made an order, dated the 28th ult., dispensing with the consent of the Vestry to the laying of the mains, thereby giving the Gas Company all they asked. After this order, and the decision of the Court of Appeal in the recent Battersea case, it is to be hoped that trading Local Authorities in and out of London will realize that they had better abandon the idea of making their general powers, of whatever nature, subserve their commercial interest. A good deal of this illegitimate abuse of administrative powers has gone on already; and there would be no end to it if the trade rivals of Municipalities were willing to submit. We have heard of shopkeepers using gas in front of their premises being ordered to "remove the obstruction," while other shops similarly displaying the Corporation electric light have been left alone. Partiality such as this is petty; but pettiness is the badge of bureaucracy. We should counsel gas consumers thus singled out to set the authorities at defiance—always assuming, of course, that there is a good defence upon the facts of the case.

Flash-Point Politics.

During the last week, the various interests bound up with the mineral oil trade of the country—with the exception of the statutory gas undertakings—have been busy over the enlightenment of the Government and the public as to the issues involved in the attempt to alter the flash-point of burning oil. It is hard to say why gas people should have been silent in regard to this new "Progressive" craze for raising the cost of a commodity now being consumed in enormous quantities for domestic and manufacturing purposes. It is certain that if the supply of lamp oil is restricted to such an extent that the price goes up, and if what has hitherto been regarded in the eye of the law as oil is to be classified as naphtha, gas oil is going to be dearer, with all the rest. It is a comforting reflection, however, that although in this country a handful of people can make a great noise in Parliament and by the aid of the sensation-loving Press, in the course of time, if they are wrong, the rights of the matter come out, to their discomfiture. The "popular" Press, in particular, is a broken reed for faddists of any brand to lean upon. Some newspapers can be enlisted to "boom" anything which looks likely to "fetch" the public for a time; but the apparent enthusiasm with which such cries are raised is only equalled by the callousness with which they are dropped the moment the "boom" is discovered to be spent. So it was with the case of the New Hellenism, the strikers in the engineering trade, the Welsh quarrymen, and other sometime burning questions. So will it be with the flash-point agitation. Meanwhile, those whose trade is directly struck at by Mr. Reckitt's Bill—which, by the way, is to come up for second reading to-morrow, when it will be opposed by Mr. R. G. Webster—have made their voices heard at the Home Office. Dr. Paul Dvorkovitz, also, has had a say upon the matter in his new periodical, "The Petroleum Review." Dr. Dvorkovitz has a clear record in this connection. He gave weighty evidence before the Parliamentary Committee against the proposition that a high flash-point means always and of necessity a safe burning oil. To the observation that high-flash Russian oil is actually cheaper than American kerosene, Dr. Dvorkovitz simply objects that this is only done to get a hold of the market; and that it is absolutely impossible that the Russian refiners can keep the price down to the present figure. The position of this authority is succinctly stated as follows: "As technical adviser to the Mineral Oil Cor-" poration, who are producing high-flash oil, I should ad-" vocate the raising of the flash-point; personally, however, " I am strongly averse to imposing a duty on the whole " population of the United Kingdom."

The latter remark suggests a proposal which should commend itself to the Free Traders who entertain such a strong objection to the existing competition in the oil trade. The Government want another source of revenue; and some of the Opposition want dear lamp oil. Why not unite the two aims, by the simple expedient of clapping an excise duty of 2d. per gallon on all oil with a flash-point under 100° Fahr.? We have asked in these columns, and in vain, for intelligence as to the probable effect on the market prices of oil of the acceptance of Mr. Reckitt's proposal. The flood of information from the North that threatened to overwhelm the "Journal" with respect to the technical—or was it the political?—side of the question, suddenly dried up after the appearance of our last inquiry, on the 21st ult., relating to the small matter of price. In the absence of the desired data, let the cost of raising all American kerosene to the higher flash-point be taken at 2d. per gallon. Would the proprietors of the rival oils be equally satisfied to see the equivalent amount of duty go into the Imperial Exchequer? It would put at least a million sterling into the Treasury, and not cost the public more than four or five times as much more. In many respects kerosene would be an ideal subject for the imposition of a new excise duty. It is a big trade; and the duty could be easily collected.

The Lock-Out of Plasterers—Trade Union Trickery.

The lock-out of the Society Plasterers threatens to be an insipid and inconclusive affair. Comparatively few operative plasterers were rendered inoperative by the carrying into effect of the federated employers' agreement; and it is reported that most of these have found work with other firms. On the other hand, the federated masters have experienced little difficulty in obtaining non-Society men and tradesmen in the business on their own account. If this is so, the struggle, such as it is, will be tedious. It may never come to a definite end at all; the masters merely refusing to employ Society hands, and the latter getting work where and as they can. This is precisely the condition of affairs in the printing trade, the employment in which is divided by consent between Society and non-Society houses. Of course, in the case of the Plasterers, both parties to the dispute claim that the other is in fault. The employers' statement was communicated to the Press after a meeting of their Committee at Derby on the 2nd inst. Mr. Deller, the Secretary of the Union, has ignored this communication, and has just issued a wordy circular full of the usual generalities about the masters desiring to crush the Society, and so forth. Meanwhile, no other Union appears to be siding with the Plasterers.

An instructive revelation of the ways of Trade Unionism, in practice, was made in the Lambeth County Court on the 2nd inst., at the hearing of an action to recover £50 alleged to have been "put away" with the object of defeating the ends of justice. On Jan. 31 we mentioned in this column the leading case of *Lyons v. The Amalgamated Society of Fancy Leather Workers*, which actually states the law of picketing. It appears that before the trial of this case, the Committee of the Society met privately and decided to plant out the available funds so that in the event of judgment going against them there would be nothing to recover. Among other favoured ones, a man who had no connection with the business in hand was stated to have received £50; and when the danger was all over, the Society officials tried to collect this with their other money. Unfortunately, the "confidence trick" broke down at this interesting point; the man denying that he had ever had the money! He

was sued in the Lambeth County Court before a scandalized Judge, who declined to order restitution to be made, on the ground that the plaintiff had not proved his case. The judgment, we are not surprised to hear, was accompanied by some scathing remarks on the action of the Committee. It is a pretty record, which would only be spoilt by comment.

The State of the Chandler's Trade.

THE timorous people who are always thinking of the advisability of selling out gas stock whenever they hear of somebody having invented a new kind of electric lamp, may be recommended to consider the example of Price's Patent Candle Company, and be wise. Here is a concern making the very oldest-fashioned kind of artificial lighting medium in existence; having been so engaged for the past 52 years. Every description of light known to civilized humanity claims to be superior to the candle; yet the Chairman of the biggest Company in the chandlery line is able to tell the proprietors that last year, notwithstanding all competition, the volume of business done had been well maintained, "and in some departments increased." Is not this most reassuring? Last year the Company cleared a disposable or net profit of £61,448. One wonders how this sum would have compared with the profits of all the chandlers in England in the days when George the Third was king, and they then had it all their own way? This Company also have the comfortable sum of £250,000 safely invested outside their business, as a protection against a rainy day. The dividend paid is a trifle more than 10 per cent. on the nominal value of the shares. Of course, we are in nowise concerned here with the conduct of the candle trade, so far as Price's Company have control of it. The concern has a close connection with the mineral oil industry, inasmuch as the chief candle material nowadays is paraffin; and through this they touch other branches of the trade of artificial lighting. But the main interest of the Company's affairs for us is the proof they supply that there is plenty of room and call for every good means of lighting up the dark places of the earth, so that no artificial luminary eclipses another.

The New Vauxhall Bridge Design.

THE newspaper controversy over the design of the new Vauxhall Bridge has been dragging on throughout the week; and now it is becoming doubtful whether London will ever have the privilege of seeing those big lamp-posts after all. The London County Council have been trying to keep a "stiff upper lip" in the face of a storm of hostile criticism; but the feeling outside seems to be growing that the Council have not treated London with proper respect in this matter. The decision as to the manner of building the bridge was in the first place at the discretion of the Bridges Committee, who originally favoured a construction consisting of stone piers and iron girders. This was subsequently abandoned in favour of a stone structure, of which Sir A. Binnie was made not only the Engineer, but also the Architect. "Hence these tears." The competency of the Engineer of the London County Council to deal with the architectural part of so important a work was impugned by the Editor of the "Builder" and others; whereupon Sir A. Binnie rounded upon his critics with the statement that his design had been approved of by high architectural authorities. This rejoinder was a "staggerer;" but the Secretary of the Royal Institute of British Architects has since written to "The Times" to state that the only occasion on which Sir A. Binnie had any communication respecting the second design with Mr. Waterhouse and Mr. Mountford (presumably the high architectural authorities referred to), was an informal and confidential interview. This puts a new face on the matter, which cannot be allowed to rest just where it is. The London County Council must set themselves right with the public, or this body will find itself at enmity with an entirely fresh and distinct order of the community. Londoners are already asking who are the members of the County Council, and who their Engineer, that they and he should venture *ex officio* to impose upon the Metropolis what they are pleased to call their taste in bridge design? For all the rest of the world knows, these worthy people may be unfit, artistically speaking, to be entrusted with the design of a parish pump; and yet the accident of position enables them to override the judgment of the best accredited art judges in the kingdom. Apart altogether from the question of the merits of this particular design, it is the absurdity of the system that rendered it possible which excites the ire of those who care for these matters. Actually, what should be a noble architectural monument for London is being taken in hand by a sort of local board who do not at the moment happen to have an advising architect upon their staff! For a monumental piece of municipal bumptiousness, this proceeding would be hard to beat.

WATER AND SANITARY AFFAIRS.

"NOTHING has been done in consequence of the Balfour "Commission, and nothing will be done in consequence "of ours." This despondent language on the part of Viscount Llandaff, unless strictly limited to the flow of water over Teddington Weir, seems scarcely warranted by the facts. The Staines Reservoirs scheme received its impetus from the report of Lord Balfour's Commission; and the interim report of Lord Llandaff's Commission has borne fruit in the Metropolitan Water Companies Bill of the Government in the present session. The recommendations of the Balfour Commission have also been acted upon by the East London Company, though unfortunately checked by the London County Council. No great change was proposed by the report of that Commission; and consequently no very startling results have ensued. Such may be the case in the present instance; but if the *status quo* is maintained, it does not follow that the inquiry has been futile. There may be good reasons for making the best of things as they are; and perhaps Lord Llandaff foresees or apprehends that he and his colleagues will neither set the Thames nor the Lea on fire. We are not aware that London desires revolutionary reports on the water supply. It wishes to be assured that the supply shall be ample as well as wholesome, and that the sources shall not fail under the stress of an ever-increasing population. On these points very satisfactory evidence has of late been given, and has been the subject of comment in these columns; while more to the same purport still presents itself. Mr. William Whitaker, of the Geological Survey, than whom a more highly qualified witness on the subject could not be desired, stated before the Royal Commission last week that it would not be going beyond the mark to estimate the total quantity of water obtainable from the chalk in the Kent district at 156 million gallons per day. To this might be added 40 million gallons per day from the lower greensand. In Mr. Whitaker's opinion, the Kent Company, by some easterly extension, could certainly double their present supply; and if a considerable easterly extension were made, the Company could probably do more than treble the supply from the chalk. After this came the question of the lower greensand—a stratum from which much water was already obtained along the valley of the Medway.

Prior to the delivery of this evidence by Mr. Whitaker, a somewhat positive statement was made by Mr. Cripps, on behalf of the County Council, that the total possible yield of the chalk in the Kent Company's district would be 27½ million gallons per day—a figure which contrasts strangely with the expert evidence of the eminent geologist just alluded to, who is not only generally conversant with the subject, but has given careful consideration to the question. Mr. Cripps further stated that the Kent Company's powers were limited to 27½ million gallons per day. In Major-General Scott's monthly reports on the Metropolitan Water Supply, it will be seen that the quantity of water to be taken from the chalk wells by the Kent Company is "not restricted." Mr. Alexander Dickson, the Company's Secretary, says he disagrees with Mr. Cripps's statement as to the limitation of their powers. Another point of some interest, as bearing on the assertion that the water supply of London is open to competition, occurs in the Secretary's evidence. It is there explained that when the Kent Company commenced operations in 1809, they had to purchase the rights of a pre-existing Company, secured under letters patent; giving that Company the "exclusive right of supplying water for 500 years." This Charter was acquired by the present Company; "so "that without a breach of these letters patent there "could be no competition in the district." Of course, there is a limit to the area over which these rights may be expected to take effect; and at the same time it is important that the vast resources of which Mr. Whitaker has spoken should all be available for more than purely local

purposes. Difficulty of severance presents itself; making the County of London dependent on outside Local Authorities. As Mr. Dickson put it, the sources of supply outside the Metropolitan area are more than the requirements of the outside districts; while the resources inside are much less than the requirements. As the Metropolitan population grew and its needs increased, new sources outside rather than inside the county would be sought. It cannot be allowed that these outside sources should be solely for the use of the Local Authorities. Such authorities would have a primary, but not an exclusive, right. No difficulty presents itself at present. All is harmony and goodwill; but the increase of population by-and-bye may produce an altered disposition. The population will accumulate in the vicinity of London, while the rich stores of "hidden water" lie farther away. "There is no absolute impossibility of "London having access to those outside sources," we are told, unless local interest asserts an exclusive claim. But the claim is one which must assuredly be limited by the necessities of the case; and the physical facts are in direct opposition to a theory of artificial severance. Kent is said to be in favour of the unification of the supply in the hands of the Company.

Mr. George Corble, the Clerk to the Lea Conservancy, described the course pursued by the Conservators in their management of the river during the restriction of the East London water supply; whereupon Lord Llandaff remarked that the Lea Conservancy, appointed in order to keep the river clear for the purposes of navigation, appeared to have deliberately sacrificed the interests of the navigation to those of the Water Companies. This seems too much like the narrow view which fails to see that the Companies are the agents or purveyors of an article of absolute need to the community. Major-General Scott, when Sir F. Dixon-Hartland, M.P., the Chairman of the Thames Conservancy Board, was previously under examination, made what we think was a much more appropriate comment. The General remarked that the demands for navigation would have to give way if there were an absolute scarcity, and the consumers were suffering from want of water. The Conservancy Chairman rejoined that it was not for the Conservancy to save the Companies from having to make storage reservoirs. The answer was one which went rather away from the supposed contingency, though the Companies may take encouragement from the statement which immediately followed—that, with ninety days' storage, there was ample water in the Thames for a hundred years. Passing to the question of quality and the microbes, Sir Edward Frankland gave evidence on points of refinement respecting filtration, and stated that he had never, in all his examinations, during a period of seven years, been able to catch a mischievous microbe. Respecting the establishment of additional control over the operations of the Water Companies, he rather recommended additional investigation and inquiry. In a couple of years, we might take up the conclusions with a view to legislation. As for buying up a portion of Wales to supply the Metropolis with water "in fifty or a hundred "years' time," Sir Edward considers that we might as well pay attention to the lakes of Cumberland and Westmoreland, as proposed to the Duke of Richmond's Commission. We may conclude that Sir E. Frankland has no apprehension that the water supply of the Metropolis is otherwise than perfectly wholesome, or that the sources are anything less than abundant. On the question of quality, he takes an entirely different position from that occupied by Professor Corfield, who, in his report to the authorities of St. George, Hanover Square, tries to make the water supply responsible for such typhoid fever as existed in London during last November, December, and January. It is a subject for the experts to settle among themselves. If an excess of organic matter, almost entirely of vegetable origin, could thus prove fatal, we wonder how London has maintained its extraordinary vitality of late years; comparing so favourably with provincial towns in the matter of its zymotic death-rate.

In opposition to the second reading of the Metropolitan Water Companies Bill on Thursday, Mr. Stuart objected to the exemption of the proposed debenture stock from the burden of a sinking fund; his argument being that such exemption would prevent the public from being sharers in the profits arising out of the expenditure of capital. Mr. Chaplin replied that as there would be no profits there would be nothing in which the public could share. But Mr. Stuart had his own views on the main question. As for the Bill itself, in his opinion it was essentially wrong. The real remedy required was to "rectify the "boundaries of the areas of supply," so that the Companies could all effectually serve their own areas. How long it would take to carry out this rectification of the frontiers Mr. Stuart did not venture to say, nor did he apparently contemplate the possibility of another drought. His sole idea was that of money and water-rates. Mr. Chaplin, on the contrary, was anxious to provide at once for a due supply of water all over London. That this could be done, by proper arrangements, he was perfectly certain; and he pleaded with the House to pass the second reading of the Bill, so that there might be no repetition of that which the people had to endure at the East-end last summer, and which he attributed in a great measure to the action of the County Council in causing the rejection of the East London Company's Storage Bill in 1893. The House was clearly in agreement with Mr. Chaplin, and read the Bill a second time, ordering it to be referred to a Select Committee. We are surprised that Mr. Stuart, as a man of public reputation, could oppose—and especially in such a manner—so necessary and beneficent a measure as that which the Government brought forward on this occasion. Of his arguments we feel compelled to say that they were not only contentious but also ridiculous. He may now console himself with the circumstance that the Standing Orders Committee of the House of Commons have allowed the Council's Welsh Water Bill to proceed. Yet the event matters little for any practical purpose, except that the ratepayers will have to pay for the promotion of a Bill which is utterly out of its place in the present session of Parliament.

The Mechanical Purification of Public Water Supplies.—At a meeting of the Civil and Mechanical Engineers' Society to be held at the Hotel Victoria next Thursday, a paper on the above subject will be read by Mr. W. N. Twelvetrees.

Dr. Strache's Water-Gas Process.—Dr. Strache's water-gas patent has been jointly acquired by the Vienna bankers, Messrs. Biedermann and Co. and Eissler Bros., who, for the purpose of turning it to account, are floating a Company at Brussels under the title of La Société Internationale du Gaz d'Eau, with a capital of a million francs. The offices will be in Brussels; but the management will be carried on in Vienna.

The Nernst Lamp.—It is stated that there is every probability of the validity of the patent for the above-named lamp being attacked in more than one country, as soon as the light itself comes into active competition with the vacuum electric lamp. It is well known that certain rare earths are non-conductors when cold, but are electric conductors when heated. This was first demonstrated by Jablochkoff. But it has since become known that such materials as magnesia, kaolin, and certain of the rare earths, can be brought to a high state of incandescence by passing an electric current through them after they have been heated in the first instance by some mechanical means. It is therefore claimed that the idea utilized by Nernst is not an original invention, but can only be termed the perfecting of a principle which has been common knowledge for years.

The Exhaustion of Guano Deposits.—On Monday of last week, Mr. J. H. Fallon read a paper before the London Section of the Society of Chemical Industry on "The Peruvian Guano Deposits from 1878 to 1898." He illustrated very ably the prosperity and decline of the Peruvian guano industry, of which there appears now to be no prospect of a serious revival. The rich deposits have been completely exhausted. In the course of the discussion on the paper, Dr. Voelcker, the Chemist to the Royal Agricultural Society, made a humorous speech, in which he referred to guano as an "old and departed friend" to whose funeral obsequies the members of the Society had come. Though much had been promised by the sponsors of sulphate of ammonia, he feared the public would never again see the equal, as a fertilizer, of the late Peruvian guano, whose early decease must be so deeply lamented.

Institution of Junior Engineers.—At the recent meeting of this Institution, of which Mr. Walter T. Dunn is the Secretary, a paper on "Carbon Consuming Batteries and their Possibilities" was read by Mr. W. R. Cooper, M.A., B.Sc. The author first considered the saving which might be effected in the production of electrical energy by the use of one of the batteries in question; and he came to the conclusion that a reduction must be effected in the capital expenditure as well as in the coal bill to enable a consumer to derive much benefit from its use. He next considered the difficulties encountered in attempting to solve the problem of the direct production of electricity from carbon, and then reviewed the suggestions made for various forms of carbon-consuming cells. Some interesting experiments were performed in illustration of the paper, which was followed by a good discussion. At the next meeting of the Institution, to be held on the 14th prox., Mr. H. C. Reid, of Chatham, will read a paper on "Piles and Pile-Driving."

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 682.)

THE Stock Exchange has had a rather anxious week. Foreign affairs were the dominating influence; and the critical point to which matters in China seemed to be tending produced considerable apprehension. Extreme caution was the rule; and business fell flatter and flatter. On Thursday, the danger of the position was regarded as so pronounced that buying was almost suspended. But the news next day, that Russia was displaying a sweet reasonableness, came as a relief; and the week closed rather buoyant. Thus the fall in prices was to a great extent recovered. Fresh business was limited by that of the settlement, which was heavy, but has not shown complications. There was a brisk demand for money; and the market had very good business. In the Gas Market, business was decidedly better, compared with the preceding week; but it cannot be said there was much real activity. Transactions were rather more evenly distributed through the list, instead of being confined to one or two of the leading issues. The tendency, too, was favourable; and a fair number of advances in price were effected. In Gaslights, there was good steady business every day in the ordinary; but it showed no disposition to go higher. It opened at 119, and one "special" bargain was marked at 119¼; but the closing mark was no better than 118. There was a moderate amount done in the secured issues; and the preference gained a point. A little was done in South Metropolitan day by day. But it did not grow stronger; and on Saturday sellers lowered their price a point. Commercials were much more active; and prices seemed inclined to harden a little, improving as they went on. None of the Suburban and Provincial group was active, except British, which was steady; but Brentford and Brighton had a rise. In the Continentals, Imperial opened weak, but mended a bit later on, and closed steady; and Union maintained its firmness. Among the rest, River Plate continued the improvement it has for some time past been making; and Monte Video had a rise. The Water Companies were as quiet as usual, and quite unchanged.

The daily operations were: Gas business opened rather quiet on Monday; but things were firm all round, and quotations did not vary. Tuesday's transactions were not very heavy; but the favourable tendency gave a rise of 2 to Brentford new, and ½ to Monte Video. Activity began to mend on Wednesday; but there was not sufficient movement to effect any change, and quotations were left standing. Thursday was much more animated; and business was brisk. Quotations were almost unchanged; only River Plate rising ¼. Friday was pretty active too; and River Plate rose another ¼. Saturday's transactions were well up to the average; and changes were more numerous. Gaslight preference advanced 1, River Plate debentures 1, and Brighton original 3. South Metropolitan was ½ lower.

ELECTRIC LIGHTING MEMORANDA.

The Electrical Press on Certain Proceedings in Parliament—Municipal Trading as Exemplified in Manchester—A Call for Evidence—The Lighting Burden of the City of London.

IT is interesting to note how electrical opinion takes the rejection of the General Power Distributing Company's Bill on the second reading. The "Electrician" regrets the Bill; but it is more disappointed with the exhibition of policy by the majority of the House of Commons on this occasion than sorry for the promoters of this particular measure. It blames this "amazing Government" for the disaster; without much reason. It complains that "opponents of 'electricity-in-bulk' companies have failed to show in what way cheap electrical power may otherwise be rendered available to the public." But this is a very weak argument; because it is not for the opponents of a measure to prove an alternative plan. The rule in such cases is for the proposers of a scheme to prove their preamble; and this is exactly where the electricity-in-bulk schemes have broken down. We are not aware that our electrical contemporaries themselves have had a good word to say for one of these quashed schemes; so why blame the House of Commons for refusing to antagonize a number of Local Authorities by encouraging an untried electrical innovation? The electricity-in-bulk people began before they were ready. They could not make out a clear case of expediency; and their unpreparedness ensured an easy victory for the municipal opposition. The "Electrical Review" is fairer to the Government and the House of Commons, recognizing the repression of municipal trading as a set-off to the rejection of the Bill. This is a better way to look at it. There can be no doubt in the mind of any reasonable man that the time has come for setting the municipal mind right as to what is legitimate in municipal enterprise; and Parliament appears willing to do it.

A great thing has been done by the Chairmen of Committees of both Houses in striking out the trading clauses from municipal Bills of the present session. The appointment of a Joint Committee to consider the subject generally is the natural and necessary consequence of this action. It will now be for the advocates of monopolistic municipal trading for profit—the avowed policy of the Association of Municipal Corporations—to persuade Parliament as to the righteousness of this view. The Lord Mayor of Manchester declared in public speech the other day that the object of the proposed great extension of the Corporation tramways system throughout the populous region of which the city is the centre is to obtain a profit revenue for relieving the city rates. Let his Lordship go before the Joint Committee and repeat his statement. Manchester sells gas, water, electricity, artificial guano, and other products of municipal collecting and manufacturing enterprise. It also has a Ship Canal. It wants a grand tramways system, a telephone connection, and what else? The question arises whether this is local self-government or mere business. Are the members of the Corporation of Manchester to be the administrators or directors of an unlimited Company? This is the kind of question Parliament has to answer. It is not an easy one, by any means. Matters have already gone so far in the one direction, in Manchester and other places, that it will be difficult to draw the line. The Municipalities have "got their heads," and will rush the House of Commons by the weight of political influence, if they can possibly do so.

Much will depend upon the composition of the Joint Committee. If the mistake committed in manning the Petroleum Committee is repeated, and a number of members specially interested upon one side of the question are allowed to twist the inquiry into a mere support of a foregone conclusion, the reference will do more harm than good. It is fortunate indeed that the Committee is to be a joint one; for experience shows that this is the ablest and most independent tribunal that can be obtained. Last year's Joint Committee spread dismay among the party of municipal monopoly; and it is reasonable to hope that the new one may be equally alive to the needs of the community, and perceive with equal clearness that these are not necessarily identical with the demands of municipal corporations. It is satisfactory to know that a Committee of the London Chamber of Commerce has undertaken the task of presenting the case against municipalism before the Joint Committee. Readers of the "JOURNAL" who may be able to support by positive evidence any of the points in this case which have been touched upon in our articles upon "Municipal Trading" should put themselves into communication with this body. Their names need not transpire, if this publicity is undesirable. In many respects, the detail proofs of the case against municipalism will resemble those obtained by the inquiry into the illicit commission system. The men who know most about the shady side and the shortcomings of municipal enterprise will not usually be in a position to come out with their story; but it would be well if the facts could be procured.

A remarkable description of the plant requirements of the City of London Electric Lighting Company, as prescribed by the lack of anything like storage on the one hand and the liability of the district to sudden fogs on the other, appears in the "Electrician." With regard to the character of the daily load on this Company's system, it is justly remarked by our contemporary that it is doubtful if there is another place in the whole world which exhibits such vagaries, and has so many characteristics "trying alike to the plant and to the engineering staff, and exasperating to the shareholders." Manchester has black days enough, and bad fogs in plenty; but the peculiarity of London is to have darkness as it were precipitated upon the city in a moment, without warning. We have often remarked upon the phenomenon of all London lighting up within five minutes, perhaps in the middle of the forenoon, and observed how on such an emergency the gasholders merely sit down to their work. The electric lighting stations are in very different case. At Bankside, the latest idea for dealing with these sudden pulls upon the resources of the establishment is embodied in a pair of Ferranti "sets," each consisting of a 2500-horse power steam-engine coupled direct to a 1500 kilowatt alternator. Of course, this means that a sufficiency of boiler power has to be kept under steam, so that these enormous "sets" can be started by a touch. It must be difficult to make a good showing for a power station handicapped with such arduous working conditions. The load diagrams of the station are truly heart-breaking. The "peak" that may come on at any hour of the day—notably, on one occasion, on May 27 last—is of frightful eminence; and one can only truly sympathize with the devoted station staff who are expected to earn dividends under such conditions.

The Venturi Meter.—We learn from "Cassier's Magazine" for the current month that the inventor of this meter in 1881 was the hydraulic engineer of a prominent water company, and that he named the instrument in honour of the pioneer experimenter on the physical properties of diverging tubes. It was not until 1890 that the first three meters for actual use—two of 48 inches and one of 36 inches diameter—were set in the line of the main conduits of the East Jersey Water Company, then supplying the city of Newark. This system has since found its way into waterworks now supplying a number of Municipalities in New Jersey, consuming from 55 to 70 million gallons of water per diem. This large quantity is metered daily through two receiving meters, 48 inches in diameter, and again through eleven selling meters, from 48 to 12 inches in diameter. The records of the two receiving meters check up daily with the records of the eleven selling meters, or, if not, the management soon discovers where the leak is which causes the mischief.

MUNICIPAL TRADING.

THIRD ARTICLE.

THE question of Municipal trading may appear to some to have become less pressing by reason of the disappearance of the various Bills proposing to distribute electricity generated "in bulk." Really, however, the settlement of the principle ought to be facilitated by the removal of these doubtful projects, inasmuch as the subject of Municipal trading should be regarded, not in the abstract, but as a general proposition. This is the way in which the memorial of the Council of the Society of Arts to the Home Secretary puts it. The memorial states that the Society "have been giving very careful consideration to the increasing tendency of Municipal and Local Authorities to embark in trading enterprises which may be in competition with, or to the exclusion of, private enterprise;" and they have been forcibly impressed with a sense of the necessity of an inquiry into the whole subject by a Royal Commission. This address was the outcome of the paper and discussion on "The Cost of Municipal Enterprise," which occupied the attention of the Society on the 1st and 8th ult. The most reckless of Progressive politicians must perceive that the recent growth of Municipal indebtedness in this country is an element of the national life which calls for serious consideration. Mr. Dixon H. Davies pointed out how little the ordinary ratepayer has to do with the piling up of this Municipal debt. In theory, of course, he is supposed to be a consenting party to everything that his representatives in Local Government do in his name; but actually the Metropolitan ratepayer is not more responsible for the fact that London only owes £130 per £100 of rateable value, than his fellow in Manchester is for owing £525 per £100 rateable value. This thing is done for the ratepayer without his being able to help himself one way or the other.

Perhaps one-half of the local indebtedness of the country, taken altogether, is on account of what are classified as reproductive enterprises, which need not be catalogued. Some of these undertakings are simply trading ventures, carried on for the sake of profit. This is where the question of expediency emerges. Those who advocate Municipal trading usually do so on the specific grounds mentioned by Mr. Davies: (1) That a public authority can raise the necessary capital more cheaply than a private Company can; and that therefore to leave large undertakings in private hands is to sacrifice an economical advantage. (2) That if a profit can be made out of the general supply of some commodity for the community, the community should realize the profit for itself. (3) That the motives of private adventure are self-seeking and sordid, and contrast unfavourably with the disinterestedness of a Municipal body. (4) That certain classes of undertakings being necessarily monopolized, it is better that Government should be the monopolist than a private person. The answers given by Mr. Davies to these contentions are, with regard to the first, that the claim covers a fallacy, and is at any rate of small importance. On the second plea, he adduces the difficulty of a corporation holding an even balance between the ratepayer as proprietor of the works, and the ratepayer as consumer. An illustration is supplied by Nottingham, where the gas consumers pay the entire cost of the University College. Mr. Davies will not allow that the sale of gas at cost price would remove the injustice; because it would still leave the non-gas-consuming ratepayer saddled with the additional capital debt "for the purpose of subsidizing his neighbour who has commercial needs that do not affect him." The third plea is described as containing a good deal of cant. With regard to the fourth, which asserts the plausible principle that monopolistic services ought to be in Government hands, what it truly means is that when such services are in Government hands, they must be upheld as a strict monopoly.

Here we have the crux of the present position. The House of Commons has recently taken note of the matter in two different senses. It threw out the General Power Distributing Company's Bill rather than allow a roving interference with the development of electricity supply by Local Authorities; but it also listened sympathetically to Sir John Lubbock's protest, on the order for the second reading of the Bootle Corporation Bill, against the growing tendency of Municipalities to occupy themselves with trading and manufacturing details to the detriment of their proper office. The leader of the House has promised an inquiry into the question by a Joint Committee; and meanwhile the Chairmen of Committees of both Houses have agreed to strike out of Local Authorities' Bills all proposals of a trading or manufacturing character. The opportunity is therefore a favourable one for a thorough consideration of the question independently of particular local requests. As Sir J. Lubbock says, we are now "at the parting of the ways" in this regard. Step by step Municipal trading has been pushed on, until it has become necessary to call a halt for the purpose of ascertaining whither the movement is tending, and how far it ought to be permitted to go.

We incline to the belief that Parliament will pull the Municipalities up on their commercial course. This will be done, if at all, because the fashion of Municipalism has betrayed a tendency to disregard the principles enunciated by Sir H. H. Fowler at Wolverhampton. If, when a public service or supply has once been municipalized, it is for ever after to be maintained as a monopoly, then the prior right of the community to the cheapest service or supply must be abrogated. Parliament has no power to lay such a disability upon the people of this country. Those Municipal Corporations who have joined in the demand for strict monopolistic privileges have overreached themselves, inasmuch as they have shown Parliament good reason why they should not be placed in the enjoyment of any further commercial enterprises. Mr. Davies aptly illustrates this aspect of the subject by referring to the case of the great trunk railways. Such lines are practically monopolies; but their monopolies are, and always have been, conditional. Supposing the main lines had been "Nationalized," thirty or forty years ago, should we for years have had four separate great trunk railways running from London to the North, and a fifth just opened? To ask such a question is to answer it.

But the case against the further extension of Municipal trading does not rest only upon the greater public interest. It is capable of being supported in the interest of Corporations themselves. These Local Authorities all have their proper office to fulfil, for which they are indispensable. Other agencies can trade; but our Municipalities must attend to the work of Government. The attraction of trading profits is considerable; but as Sir J. Lubbock remarks, the Manchester Ship Canal exists as a warning that Municipalities can lose, as well as make, money. He opposes the extension of this dangerous privilege of trading by Municipalities also "because they would be diverted from their true and most important functions; because they would be dragged into labour struggles in which it is most important that they should not be involved; and because it would be dangerous to the honour, dignity, and character of Municipal life." At the best, Government management of public works in unprogressive, non-inventive, mechanical. Bureaucracies are stagnant, bound to act in accordance with fixed ideas. This kind of administration may answer well enough for carrying on such a simple trade as the supply of water; but "in any branch of industry which is of a mobile character, and which depends on the education of the public, and the tempting of customers, the private capitalist who understands his own business, and is free to conduct it in his own way without having to reckon with the opinion of a host of other people who know nothing about it, must have an incalculable advantage."

Mr. Davies was probably unaware of the singular proof of the justice of this view supplied by contemporary history of the prepayment meter system of gas supply. The gas trade is not open to many new departures; but the popularization of gas among the poorer householders by the offer of free piping and a penny-in-the-slot meter was one of the rare novelties of the industry during the last decade. Some of the larger Gas Companies were slow enough to perceive the advantage of selling their product by the pennyworth; and a few gas companies' officials were found to be so far imbued with the bureaucratic spirit as to scorn the idea. Long after the Gas Companies as a whole had gone briskly into the new branch of trade, however, the big Corporation Gas Committees were lagging behind; and to this day the latter have not overtaken the former in this respect.

A trading Municipality is not only rigid in its methods, it is peculiarly susceptible to corrupting and degrading influences. That of trade unionism was very properly mentioned by Mr. Davies. It is notorious that Municipal employers accept the dictation of Trade Unions in the matter of rates of wages; but there is also the consideration of the "Union stroke," to which they must equally bow. Every economic heresy that a Trade Union may fall into must infect the Municipal service. But this is not all. A municipalized service is one that bars out everything in the shape of co-operation, profit-sharing, or anything that might tend to unite the interests of employers and employed. Municipal capital is forever out of the reach of those who work for it. All they have to hope for is to get the utmost they can for their services, while rendering the smallest permissible return. When this spirit governs the workpeople, the only power that keeps it in check is the sense of duty and professional pride of the superior officers. Mr. Chamberlain, arch-municipalist as he is, has admitted the supreme value of this guarantee of good Municipal service. It is, however, but a thin defence between the ratepayers' property and those who would raid it. Already the political influence of the Trade Unions has in several instances gone behind the upright corporation officer and has neutralized his power with his Committee; and what is to happen in the end of these things? Surely, for their own sakes, as well as for the public good, "the Corporations would be well advised to confine their functions to those important public matters in which all their constituents are equally interested, and which must of their nature be performed by the ratepayers in common, and which involve no taint of partiality, or suspicion of class bribery . . . . let them leave to private enterprise whatever private enterprise will undertake, keeping themselves in an impartial position; so that they may secure the unsuspicious loyalty and obedience of all the traders to the regulations they impose upon them for protection of the common interest."

A little bit of fact is worth any amount of speculation in elucidating a matter of this kind. At the annual dinner of the Manchester Association of Engineers, the Lord Mayor of Manchester is reported to have said that "he thought he was able to prophesy that the Corporation of Manchester would be able so to conduct their tram-car system in the future that it would bring a very large sum to the Treasury of the Corporation, and thus relieve

the rates of the City." It is to be hoped the contributories to the new plan of indirect taxation for the benefit of Manchester like the prospect. The Lord Mayor also boasted that the Corporation are "making a large profit" from their electric lighting business. This is another bit of information which will not be overlooked when the account for and against Municipalism comes to be made up. A valuable fact of another order is the decision of the Works Department of the London County Council not to take any action in regard to the lock-out of the Plasterers determined on by the National Association of Master Builders. The County Council agreed that the Department could not act like any ordinary employer, but must stand aside out of the present dispute. A reasonable decision in the circumstances, but proving up to the hilt the accusation that these municipalized undertakings are not free, like ordinary employers, to take whatever precautions may be found expedient by common consent for the protection of the capital and the business.

In the discussion upon Mr. Davies's paper at the Society of Arts, one of the strongest speeches made was that of Mr. Dundas Pillans, who followed Mr. John Burns, M.P. Mr. Burns said a great deal; but having regard to the fact of his admission, in reply to a question of Lord Wemyss, that he wished to see all private property in the hands of the State or a Municipality, it is unnecessary to go into details. We are sorry not to have been able to reproduce Mr. Pillans's remarks, or Mr. Davies's reply to the discussion. Especially we should have liked to publish from the Society of Arts "Journal" of the 17th ult., the author's supplementary contribution towards the solution of the problem set by the Attorney-General—to ascertain the extent to which the ratepayers have really benefited by the profit-making operations of their trading Corporations. Mr. Davies, like ourselves, finds it very difficult to obtain any precise and reliable information upon this head. All that is really certain is that "the indebtedness and also the rates in the large towns have increased during the last twenty years out of all proportion to the growth in value of the ratepayers' property." This is a heavy indictment of the policy of Municipalism, which has now come before Parliament as a distinct issue.

THE REPORT OF THE LONDON CHAMBER OF COMMERCE ON SECRET COMMISSIONS.

The London Chamber of Commerce have published the report of the Special Committee of the Chamber on Secret Commissions, and we give the substance of this statement in another column. Although the newspapers have reproduced the report, and some of them have commented upon the Committee's findings at a fair length, we cannot admit that the Press treatment of this matter has been at all adequate to the deep and far-reaching moment of the subject. Only "The Times," and a few of the more serious journals have given due prominence to the report. It would be impossible to exaggerate the importance, we will not say of the report itself, but of the subject matter with which it deals. "Secret," which is another term for illicit "commissions," are a canker of civilized life which came into existence with the life itself; and will last as long as any other kind of roguery. The inquiry of the London Chamber of Commerce was prudently limited to the question of secret commissions in commercial and professional life. As soon as the Committee began to investigate, evidence establishing the existence of the practice poured in upon them; and they had no difficulty in arriving at the conclusion "that secret commissions in various forms are prevalent in almost all trades and professions to a great extent, and that in some trades the practice has increased, and is increasing." Trade bribes, to employ the shorter term, are both offered and demanded. The first mischievous effect of the practice to be noted is the impression it creates among traders that business is not to be done without it. Here we have the introduction, as a powerful factor in commerce, of an influence of which writers on Political Economy fail to take account. To say the least of it, it disturbs the natural operation of such respectable factors as the price and quality of the goods. If it is necessary—or believed to be necessary, which, in practice, often amounts to the same thing—to "square" somebody who has a "say" in the disposition of orders, the very foundation of honest trade is sapped.

Bribery exists, always has existed, and will continue to exist among all sorts and conditions of men, just like "original sin." There is no denying this painful truth; but although the evil is very common, it is not universal. Many men there are, in all ranks of the industrial community, who have never taken or offered a bribe in their lives, and would "scorn the action." The right way of looking at the matter is to regard it as a weakness of humanity of the same order as intemperance. This is the view taken by the Committee; although they do not say so in plain words. They point out that though there is much corruption in trade, it is not so bad as formerly. There was almost universal and unblushing bribery at one time throughout every rank and calling in Church and State; whereas now it is at least disgraceful and kept secret, like the habit of drink. The main practical question is whether it is wise or possible to do anything by way of legislation to expedite this process of gradual moral elevation, or to stamp the evil out in the corners and byeways where it may be expected to linger long after the great volume of business has shaken it off.

How singularly alike are the problems of trade bribery and intemperance! One can apply the same observations to both, in almost every particular. From both evils, complete deliverance can only be effected by the possible victims becoming superior to the temptation. Meanwhile, as regards remedial legislation, it is never safe to advance very far beyond the public conscience. Reformers are always apt to think that the mass of the public of their own time are of like mind with themselves, if the fact could only be ascertained. But this confidence is rarely justified. In the case of secret commissions, among the higher ranks of professional people and officers of Government and large undertakings, there is undoubtedly a great improvement. Officials do not often grow rich mysteriously, as in former times. But legislation has had little if anything at all to do with this alteration of the canon of professional conduct. Some officials may be honest through fear of Lord Randolph Churchill's Act; but they can neither be numerous, nor worth much consideration. It seems a simple thing, at the first glance, to make Lord Randolph Churchill's Act apply generally to persons in positions of trust; but upon further reflection it will be perceived that no such sweeping legislation would be of much real good effect.

The utmost that the Committee can recommend by way of penalizing the practice is that it should be made a criminal offence to pay, receive, offer, or solicit any "corrupt payment;" and also to give any invoice or other document calculated to enable the recipient to commit a fraud upon his principal. There is reason in these suggestions. It would be for the Court to determine what are corrupt payments in any case. Legislation of this kind would not stop illicit commissions; but it would place a danger in the way of further extensions of the practice. With few and decreasing exceptions, however, the bulk of the evil is not now with the higher placed professional men and officials; but it is still rife among the lower orders of industrial life, with whom, although the individual payments may be small, the aggregate tax upon trade in this shape is heavy. But the cost of the system is the least of the objections to it. What is worse is the injustice inseparable from this petty bribery; and the atmosphere of double-dealing and treachery which it creates. Many trades, unfortunately, reek of this mephitic atmosphere, the difficulty of dealing with which is enormous. The Committee offer something very like a counsel of perfection when they suggest that principals should always inquire for themselves why goods are refused, or why advice is given hostile to particular manufacturers. The affairs of a large undertaking are not to be managed in this way; but a good deal might be done if the heads of the buying and selling firms were oftener on confidential speaking terms. As it is, the heads of the administration of many undertakings carry themselves like Olympian gods; for which aloofness, of course, their employers suffer.

One paragraph of the report can be heartily supported. It relates to the deplorable circumstance of "buyers and others who are employed in very responsible positions, and have very important duties to perform," being paid inadequate salaries; and being thus exposed unduly to temptation. It is remarked that this state of things "demands the careful consideration of the heads of firms." This, again, is an old grievance. It is the result of the yielding of employers to the universal temptation to try and run their business "on the cheap." Accordingly, boys are put at the heads of departments, or foremen are given the work but not the pay of managers. The end of it is always the same. The boys make costly blunders, and play havoc with the trade; and the knowing foreman "feathers his own nest." This is one of the common results of the Municipalization of gas and water undertakings. Gas Companies do not as a rule pay their officers as highly as private traders would do; but when the property passes into the control of a local authority, matters almost invariably become worse in this respect.

The evidence, reports of law cases, and other matter forming the bulk of the appendices to the report do not add materially to the general stock of information relating to the subject. From the nature of the evil, precise statements giving names and dates are not to be expected. It is worthy of notice, however, that two instances of venality on the part of a member of a Municipal Corporation are recorded. The Electric Construction Company, Limited, forwarded to the Committee a copy of correspondence that they had had with the Corporation of West Ham, "complaining that a much higher tender than theirs for an electric lighting installation had been accepted; and calling attention to the fact than an offer had been made to them of the assistance of a member of the Corporation in getting the contract, if they were prepared to negotiate for his services, which offer was at once rejected." Again, another electrician reports that in his numerous negotiations with local authorities he is constantly receiving intimations that he could make his path much smoother by availing himself of the services which members of Corporations are willing to render "for a consideration." It is impossible to agree that any legislation could cure this mischief. Those who offer to sell their interest in such a way know quite well the nature of the crime they propose to commit. They also know the risk they would run; and they are willing to take it. Such is the way of the criminal classes.

We are disposed to agree with the Committee that the mere discussion of the subject is calculated to do good, by setting in a clear light the true character of the practice. We also believe that much might be done by the heads of firms resolving to put a stop to everything of the kind, root and branch. There is no

need to split hairs over it; and the "unco' guid" is only a little less offensive than the open sinner. So long as business people are human, they will do their business in the easiest manner. There are many ways in which business can be facilitated, when it is done as between friends. On the other hand, the fulfilment of obligations to the letter may be a painful process. The spirit of the thing is not difficult of discrimination. It is best, of course, to avoid utterly not merely the evil, but also the mere appearance of it. Those who in their rectitude do not forget to be charitable will win more to follow their good example than the furiously virtuous who would "make it felony to drink small beer" under certain conditions. As the Committee recognize, "it would be a matter of difficulty to define the offences with adequate breadth without including acts of an innocent or trivial character;" and therefore an awakened and instructed conscience must after all be the best guide for individuals along the plain path of duty.

"ILLUMINATING GAS STATISTICS."

THERE is a suspicion of a pun in the title of an article which appears in the March number of "The Journal of Finance," on the subject of the Board of Trade returns relating to the gas undertakings of the United Kingdom. The author, Mr. Andrew Still, finds the returns "a dreary compilation," which give no indication of the purpose they are intended to serve, and in fact are of no use whatever in their present form. With a laudable desire to remedy the defects, Mr. Still has turned upon the figures such light—unfortunately a somewhat feeble ray—as he possesses. The result is the exhibition of a few really startling conclusions. We are told of "the astonishing progress" and "the magnitude" of the industry; of the growth of the invested capital from 48 millions sterling sixteen years ago to 72½ millions; of the increase in the consumption of gas from 66,614 million feet to 122,220 millions; and of the advance in the number of consumers from 1,972,000 to 3,025,000. We are reminded that the period which has witnessed this expansion also embraces the great development of the electric light, and that there has been a complete falsification of the prophecies that gas was "doomed to immediate extinction ten years ago." Yet, side by side with all this, we find Mr. Still indulging in melancholy prognostications on his own account. The electric light and acetylene gas are, he says, "bound in time to become very dangerous rivals to coal gas for lighting purposes, and will ultimately supersede it entirely." It is true "it must be many years before coal gas is superseded by other illuminants to any appreciable extent"—which seems obvious enough if the statistics of the past convey any lesson at all and are any guide to the future. But "about its ultimate fate in that direction" Mr. Still has no doubt whatever. Prophecy has been described as a gratuitous form of error; but we remember few examples of it so utterly at variance with the facts upon which it is apparently based.

Although the article is evidently the outcome of considerable labour, it is obvious that Mr. Still has brought to his task no special qualifications. He is unacquainted with so elementary a matter as the operation of the sliding scale; and of its genesis he knows less than nothing. "Parliament," he tells us, "after a long and tedious agitation got worried into enacting a piece of very useful gas legislation, and it was apparently so self-satisfied with the achievement that it has gone to sleep over the question ever since." As an historical record this is far from perfection; and Mr. Still is led by this misconception of the origin of the sliding scale into other errors regarding it. It is, for example, hardly correct to say that sliding scales were fixed at a time "when the cost of production was very much higher actually as well as relatively," and when "a large proportion of the residuals was considered absolutely waste products which were an expense to dispose of, instead of a source of revenue." The fact is Mr. Still has not clearly discriminated between the sliding scale and the old principle of maximum dividends.

This is made very manifest when he comes to describe what the sliding-scale is. He correctly defines the principle as one by which "for every reduction in the price of gas below a certain point the company will be allowed to pay a higher dividend, and consequently it is to the interest of the companies to reduce the price as much as possible." Then by a curious mistake as to the working of this principle—which he declares to be "the best that could be devised for protecting the public"—he proceeds to say that "in practice the object is not attained or even approached." Why it fails he explains by means of an illustration: "Suppose the sliding-scale commences at 4s. per 1000 cubic feet, the company may attain the maximum dividend which it is allowed to distribute on the basis of 3s. 4d., and it has no inducement to reduce the price below that figure, although it could probably sell gas at 2s. 6d. and still have a profit. For the sake of appearances it may make a slight additional concession to consumers, but the bulk of the extra profit is considered legitimate plunder by the people who run the business."

Such blundering absurdities are more suited to the columns of a "Progressive" newspaper than the sober pages of a periodical making some pretence to deal with facts and discuss questions of finance and investment. Mr. Still means well, or at least he imagines that he means something. Unfortunately, he has only so superficial a knowledge of the subject as to imagine "it would be a very simple matter to make the standard for the sliding-scale adjust itself automatically to changed conditions of production." Parliament, he thinks, should undertake this "simple" business, as well as that of reducing "the maximum dividends allowed" to sliding-scale companies. In another place he tells us that "a revision of the sliding-scale standards would work wonders"—no doubt "wonders" of spoliation and robbery; for even Mr. Still has not overlooked the fact that gas stock is now valued on the market on a 3 to 4 per cent. basis.

PERSONAL.

Mr. F. J. BANCROFT, B.Sc., the Water and Gas Engineer of the Hull Corporation, was last Tuesday elected an Associate Member of the Institution of Civil Engineers.

Mr. C. E. BEAN has resigned the appointment of Photometrist which he has held in connection with his office of Analyst to the Corporation of Plymouth. In future, the testing of the illuminating power of the gas supplied in the borough is to be done by the new foreman of public lighting.

In connection with the inauguration of the new building of the Middlesex Hospital Medical School, Dr. FREDERIC HETLEY, a former student, has contributed £1000 to perpetuate the "Hetley Clinical Prize" of £25 per annum founded in 1884. Dr. Hetley is a Director of the Crystal Palace District Gas Company.

Mr. W. BLAIR, Manager of the Haddington Gas Company, has been unanimously appointed by the Helensburgh Town Council Manager of the gas-works there, in succession to Mr. W. Smith, resigned. Mr. P. BLAIR, Manager of the Blaenau Festiniog Gas-Works, has been chosen by the Directors of the Haddington Gas Company to succeed his brother.

Mr. ALEXANDER SMITH, a son of Mr. A. Smith, of Aberdeen, and one of Mr. Foulis's technical assistants at Glasgow, where he has superintended the reconstruction and extension of the Tradeston and Dawsholm Gas-Works, has obtained a similar appointment under the Birmingham Corporation; and on Thursday night he was entertained at dinner by his colleagues, who offered him the heartiest good wishes for his success.

OBITUARY.

The death is announced of Mr. GEORGE LINES, the Secretary of the Kineton Gas Company. Deceased was Bailiff of the Manor of Kineton, and held several honorary appointments as well.

The death took place on Monday last week, in his 61st year, of Mr. CHARLES GAY ROBERTS, who had for about seven years held the position of Chairman of the Haslemere Gas Company.

The iron and steel industries of Middlesbrough have lost one of their most conspicuous representatives in the person of Mr. JEREMIAH HEAD, who died at Hastings last Friday, in his 64th year.

The sudden death, at Dessau, on the 3rd ult., of Herr ANDREAS BUHE is announced. He was for nearly 35 years connected with the German Continental Gas Company, at first as Chemist, and subsequently as Chief Engineer. He was the author of many valuable technical papers, of which several treated of the purification of gas. Deceased was in his 65th year.

The death occurred on the 3rd inst., in his 79th year, of Mr. SAMPSON S. LLOYD, a member of the firm of Lloyds Banking Company, Limited, and at one time Managing-Director and Chairman. Some years ago, he was in partnership with his son in the well-known tube works of Messrs. Lloyd and Lloyd, and was also financially associated with the firm of Messrs. Thomas Piggott and Co., of Birmingham.

A prominent burgess of West Bromwich has just passed away in the person of Alderman FARLEY, who died last Saturday night, at the age of 75, as the result of a paralytic stroke on the previous day. Deceased had always taken a keen interest in the gas supply of the borough. He was the leading spirit in the protracted struggle carried on by West Bromwich, in conjunction with Oldbury and Smethwick, with the Corporation of Birmingham, the result of which was the acquisition by those places of their right to manufacture and supply their own gas; and he was Chairman of the Gas Committee from the first till the time of his death. He had been five times Mayor of the town, which he had seen grow from a village of 5600 inhabitants into a flourishing county borough with a population of 63,000.

We regret to announce the death last Friday afternoon, at his town residence, of Sir DOUGLAS GALTON. Born in 1822, he entered the Royal Military Academy at Woolwich at the age of 15, and received a commission in the Royal Engineers in 1840. Seven years later, he became Secretary to the Railway Commission; and all through his life the subject of railways engaged his attention. His knowledge and experience in this branch of engineering obtained for him the distinction of being elected in 1894 an honorary member of the Institution of Civil Engineers. He was, however, best known as an authority on sanitary questions. He strongly opposed the scheme of the late Metropolitan Board of Works for the disposal of London sewage by discharging it into the Thames in the neighbourhood of Barking, and urged the desirability of conducting it to Lea Reach. He

was a prominent member of the Society of Arts and of the Sanitary Institute—in fact, he held the position of Vice-President and Chairman of the Council of the latter body; and only a few weeks ago he presided at a meeting at which the subject of the London Water Supply was discussed, and raised his voice against the "bogey of bacteria." Sir Douglas was for 25 years General Secretary of the British Association—an office which he resigned in 1895 on becoming President. He was elected a Fellow of the Royal Society in 1863, and was a member of many other learned societies. He received from Oxford the honorary degree of D.C.L., and from Durham and Montreal that of LL.D. He was made a C.B. in 1865, and a K.C.B. in 1887.

NOTES.

An Unknown Companion of Carbonic Oxide.

Professor W. Ramsay, in the Wilde Lecture for the present year of the Manchester Literary and Philosophical Society, discussed the newly-discovered elements of the atmosphere and their relations to the kinetic theory of gases. It was explained that, whereas the law of the expansion and specific heat of gases is experimentally true for mercury gas, it is not true for the common gases—oxygen, hydrogen, nitrogen, carbonic oxide, &c. The newly-discovered gases argon and helium possess the theoretic ratio of specific heats. This characteristic was followed up; and after a long search, other obscure gases were isolated. A curious result of the investigation was the indication that there must be another gas somewhere; and to this still unknown element the name "xenon," or the "stranger," has been given. Curiously enough, when Professor Ramsay's appointment on the Carburetted Water Gas Committee is borne in mind, he has observed that with a sample of gas showing the spectrum of carbonic oxide there were other lines discernible, the nature of which has not yet been determined. Meanwhile, the new comer has been provisionally named "metargon." These gases are still being investigated. All that is known of them at present is their spectra, which have been unmistakably distinguished. The fact of an unknown gas being detected as a companion of carbonic oxide is a reminder that science is far from having said the last word concerning the composition of the material of the earth and its envelope, the atmosphere.

Occlusion of Oxygen for Industrial Purposes.

Attention was called in a recent "Note" to a proposal of M. Jaubert to employ occluded oxygen for trade purposes. The suggestion has attracted the notice of several French chemists, who have sent communications to the "Comptes Rendus" on the subject. With reference to the secret substance claimed by M. Jaubert as possessing the property of removing from the atmosphere of a closed chamber the carbonic acid, water vapour, and other irrespirable gases produced by a living animal within the chamber, while releasing a corresponding supply of oxygen, Messrs. Desgrez and Balthazard describe their own experiments with sodium peroxide. This substance is acted upon by water, yielding caustic soda, which will, of course, absorb carbonic acid. The effect of this was shown by experiments with guinea-pigs in closed vessels. One such animal weighing 400 grammes, when shut up in 10 litres of air, became asphyxiated in 2½ hours; but when sodium peroxide was enclosed with it, and exposed to dropping water, the animal showed no diminution of vitality at the end of four hours. Other experiments went to show that even the moisture of expired air was sufficient to activate the peroxide. M. D'Arsonville narrates that seventeen years ago he proposed an effective method of achieving the same end. He employed soda-lime for absorbing the carbonic acid and water, and obtained the oxygen from hydrogen peroxide dropping into a strong chromic acid solution. The arrangement was automatic; but the character of the apparatus employed was such as to limit the operation to laboratory experi ments on living animals, and it had no industrial application.

The Lightning-Flash System for Lighthouses.

While the electricians interested in the so-called lighting of public streets and open spaces by electric arc lamps have persistently ignored the physiological effect of intense light centres upon the human subject, this has formed the point of departure of the new system of lighthouse working, which was the subject of a paper read by Mr. W. T. Douglass and Mr. J. A. Purves, at the Institution of Civil Engineers. The paper was a description of one of the most noteworthy triumphs of modern science—the introduction by Mr. Bourdelles, in 1890, of what is called the "lightning-flash" principle for lighthouses. For light-house purposes, a fixed light of sufficient power and penetration for the situation is the best; but the necessity of offering the navigator some means of identifying every lighthouse, entails the introduction of some variation. After much experiment, it was ascertained that complete perception of a beam of light is ensured by its being allowed to rest on the retina for 10 seconds. Any longer exposure of the light than this is waste. Acceptance of this fundamental principle, which was first admitted by the French lighthouse service, resulted in a marked simplification and economy of the necessary apparatus. The old style of hyper-radiant lanterns had grown to gigantic and costly proportions; but this has now become obsolete. A typical new form of lightning-flash apparatus was installed last year at Armen, on the west coast of France. The light is that of the incandescent gas-burner, supplied on the spot from a mineral oil-gas plant. The beam is raised to 300,000-candle power. At Dieppe, a double apparatus of the same kind is being provided. It is claimed that the new system possesses many advantages as regards economy, both of construction and working. Although, of course, the incandescent gas light is not the only light source that can be employed in this system, its brilliancy and low cost commend it for use wherever it can be arranged for.

Forerunners of the Nernst Light.

Those who may have seen something portentous to the future of older artificial lights in the sensational display of Nernst lamps at the Society of Arts, will be interested in an article appearing in "Engineering" for the 3rd inst., which discusses the Nernst invention in the light of older attempts of the same kind. Mr. Swinburne has not overlooked the once-familiar Jablochkoff "candles" and the "Sunbeam" electric light, in which the arc was made to pass through a block of marble, which it rendered incandescent. "Engineering" shows, however, that Jablochkoff actually patented a small incandescent electric lamp nineteen years ago, in which the luminescent body was kaolin, or something similar, and was suspended in the form of a thin oblong plate between a pair of conducting terminals. Although our contemporary does not remark it, this particular Jablochkoff light would have had the same appearance as the luminous portion of a common flat-flame gas light, which was probably the idea that suggested itself to the inventor's mind. Nernst seems to have carried the suggestion on from the point at which Jablochkoff left it. He has had the great work of Dr. Auer von Welsbach to guide him; and consequently he has gone in for the supposed advantage of blending the refractory metallic oxides with his electrolytic composition. As to this, however, as "Engineering" remarks, the inventor is venturing upon uncertain ground. It cannot be said definitely that thoria or anything else will act in an electrolytic body to the same luminous purpose as it does in the Welsbach mantle. One non-wasting refractory body may glow as brightly as any other non-wasting body at the same high temperature. It is stated that the original form of Jablochkoff's small incandescent electric lamp was included in a small "scratch" collection of electric lighting appliances exhibited for a week in May, 1879, at the Royal Albert Hall. It would be of interest to hear if it was noticed at the time by any reader of the "JOURNAL."

Warming by Exhaust Steam.

It is the subject of common remark that exhaust steam is rarely utilized properly as a means of warming workshops and buildings in the vicinity of the engine-house. Wherever a non-condensing steam-engine of any size is in regular use, much more can be done with the exhaust as a heating medium than is often attempted. The usual objection refers to the difficulty of conveying the heat to where it is wanted. An account published in the "Engineering Record" of a system fitted up last year for the carriage shops of a railway company at Lima, Ohio, shows how the job can be done by the help of a pressure-blower. The source of heat is exhaust steam, which is checked to a pressure of 5 lbs. per square inch by a suitable weighted outlet-valve. It is caused to circulate through a specially made coil of pipe, enclosed in a casing; and here the air is caused to pass round it. The coil and blower were supplied by the American Blower Company, of Detroit. It is a powerful combination; the blower being 9 feet in diameter, and the exit air-pipe 5 ft. 8 in. in diameter. The heating coil has a surface of 3300 square feet. The blower is driven nominally at a speed of 175 revolutions per minute, by a 12 inch by 10 inch steam-engine coupled direct to the shaft, the exhaust from which helps to warm the coil. From the heating chamber, the air-main is carried to all the shops; being enclosed in a jacket-pipe 4 inches greater in diameter where it is exposed to the air outside a building. Inside the shops the air-pipe runs along overhead, with downward-pointing outlets at intervals, each controllable by a throttle valve actuated by a string. The air escapes at the height of 10 feet above the floor. By making the outlets conical, increasing outwards, the blast would be rendered imperceptible by the occupants of the shops. There are obvious advantages in having the air supply overhead in workshops. Where appearance has to be studied, the arrangement could be altered. In the case of the Lima shops, the whole of the pipes, casings, &c., are made in the cheapest way, of galvanized iron. The two exhaust steam-pipes which feed the heater are 4 inches and 6 inches diameter respectively; and the air is intended to leave the coil-box at a temperature of 150° Fahr. when the outside temperature is zero. Such powerful heating as this is unnecessary in our milder climate; but even in this country the difference in working capacity in the case of men coming into a comfortably warmed shop in the winter season is worth securing.

The Sulphate of Ammonia Committee's Prize Essay.—We learn from the Chairman of the Sulphate of Ammonia Committee that Mr. J. Bowen Jones, of Montford Bridge, Salop, has consented to act as adjudicator, in conjunction with Dr. J. Aug. Voelcker, in the matter of the sulphate of ammonia prize essay.

TECHNICAL RECORD.

THE "JASPER" INCANDESCENT GAS-MANTLE.

The incandescent gas-mantle which bears the name of one of its originators, Herr Max Jasper, has been little heard of in this country; but in Germany, we are informed, its excellent qualities have created for it a very large demand. From the same source, we learn that the Paris Welsbach Company have been experimenting with it, and, so satisfied are they, that at the present time Herr Jasper is in Paris negotiating the sale to them of his patents for France. Negotiations are also pending in London for the purchase of the patents for Great Britain by a Company which has been primarily formed for the purpose of introducing a new self-lighter for incandescent gas-burners. A mantle which, if the information is correct, is receiving such patronage abroad, should also—if the difficulties surrounding the introduction of such articles into this country can be surmounted—prove itself a worthy competitor here.

Abstracts of the specifications of the patents covering the invention were published in the last volume of the "JOURNAL." The first one, which was communicated by the Chemische Fabrik von Max Jasper, of Bernau, near Berlin, was noticed on Aug. 16; and an extract from the second, which bears the name of Dr. A. Koch, who is the Chief Chemist at the works of Herr Jasper, was given on Sept. 27. It will be seen from these abstracts that the inventors' process can be utilized either for the making of new mantles, or for rendering "existing incandescent bodies for illuminating purposes sufficiently durable to withstand any vibrations to which the burner may be exposed." The method of manufacture is as follows: The body (whether specially made or otherwise) is impregnated with a solution containing an alcoholic and an ether organic compound of silicon, which when burnt forms silicon dioxide on the base. The silicon solution may (for example) be made up of 15 per cent. of silicic-amyl-ether, with 85 per cent. of amyl-alcohol. On removal from the solution, the body is ignited while still wet, and maintained at a red heat. The silicic acid liberated by the burning of the organic silicon compound adheres to the incandescent body, and when subjected to heat combines with the constituent parts of the body. A single dipping is usually sufficient. Dr. Koch's invention is described as a "preparatory process," which may also be made use of in connection with the manufacture of incandescent bodies in general, in order to improve their durability. Under this process, the fabric of the mantle is impregnated with a 30 per cent. aqueous solution of thorium nitrate; then freed by pressure from the adhering liquid, and dried; the dry fabric being subsequently incinerated, and then calcined and fixed in shape by the aid of gas under pressure. The resulting structure or body, which consists (apart from the natural ash-constituents) of pure thorium oxide, is then suspended from a hook, and dipped in a vessel containing the organic compounds of silicon, mixed with an alcoholic solution of cerium, as already described. A thorough moistening of the thorium structure is thus effected; and it is then, while still moist, ignited and calcined again for a few minutes. This operation results in the combustion of the organic compounds of silicon into silica, which "imparts to the structure a degree of solidity and elasticity hitherto unattainable." In addition, "the silica—by reason of its fine state of division on the thorium body, and in conjunction with the cerium—increases the illuminating power to a not inconsiderable extent."

Several gentlemen interested in gas lighting had last week an opportunity of witnessing the making of mantles in the manner described, at 88, Victoria Street, Westminster, and subsequently inspecting them alight. The mantles seen had an undeniably refined appearance, and were beautifully incandescent from base to apex. But the most interesting features of the demonstration were the tests to which the mantles were subjected to prove their durability. For this purpose, Herr Jasper (who was present) had provided an apparatus as prescribed by the Technical High School of Charlottenburg for testing mantles. This consists of a box, with a moveable lid, mounted on what has the appearance of a sewing-machine stand. By means of a treadle, wheel, and double cam, the moveable lid of the box receives a double shock on each revolution of the wheel. On the lid (which by the way has a rise and fall of about $\frac{1}{2}$ inch) is placed an ordinary metal oil-lamp formed to take the upper part of an incandescent burner supporting the mantle to be tested. The test is without doubt a crucial one; and the shocks which the mantles receive are, one would imagine, very similar to those to which they would be exposed in any large establishment where heavy machinery happened to be at work in the basement or on the ground floor.

But to return to the tests, the first mantle to "try its strength" was a Jasper, which had been made a few minutes previously. It underwent 1200 shocks at the rate of about 100 per minute; but as there were no signs of its succumbing, the test was then stopped. A "Crown" mantle—a German competitor of rather coarse texture—was next put under trial; but it commenced to fracture at 25 shocks, and completely collapsed at 44. A Welsbach "C" mantle followed. At the eighteenth shock a fracture appeared near the top; and by the time 200 shocks were reached a split had run almost completely round the base. A continuation of the test for some minutes did not appear to further affect it; but, on its being re-lighted, the fractures soon widened. A Jasper mantle was again successful in a test of 160 shocks a minute; but a Welsbach "C" collapsed after some five or six shocks. Then a new Welsbach mantle was burnt off, steeped in the Jasper solution, again lighted, and, when cold, was subjected to the test. Although the treatment it had received had caused a slight split at the bottom, 1000 shocks made no further impression on it. Various mantles were also placed on a loosely fitted upright gas-pipe, and roughly vibrated sideways; but this had little or no influence on any of them. We have also been supplied with the results of tests at previous demonstrations, which substantiate those already noticed. Only one test need be mentioned, and that was with a Voelker mantle (which had been in use about 1000 hours), and which was only able to endure 17 double shocks before collapsing. In watching these experiments, it occurred to the writer that they (quite apart from the relative strength of the mantles tested) to some extent went to prove that it is not so much from the lateral vibrations that mantles in public lamps suffer as from the springing jerks communicated to them by the passage of vehicles over shallow laid service-pipes supplying the lamps.

So far as we have been able to ascertain, no photometrical tests of the Jasper mantle have been made in this country; but tests made in Germany give to the light a value of 70 Hefner candles, at a gas consumption equal to the Welsbach "C" burner. We are also informed that one of the mantles was in use at the address previously mentioned for 1420 hours, and was then only destroyed through the breaking of the chimney. It is further stated that the candle power remains constant, and that, at the end of a long run such as the one just mentioned, the deterioration in lighting efficiency is certainly not more than 5 per cent.

THE LIGHTING OF THE LONDON TERMINUS OF THE GREAT CENTRAL RAILWAY.

Last Thursday, one more line of communication between the Provinces and the Metropolis was made available to the public by the opening of the Great Central Railway, the London terminus of which is situated in the Marylebone Road. The event only calls for notice in these columns in so far as it serves to place on record the fact that the system of lighting adopted for the station marks an entirely new departure in gas lighting. There are fixed upon the platforms and promenade, booking hall, and parcels office 19 lamps, each of 1000-candle power, 3 lamps of 670-candle power each, and 14 lamps of 335-candle power each; making a total of 25,700-candle power. The consumption of gas by these burners is 770 cubic feet per hour, supplied from The Gaslight and Coke Company's mains under a 3-inch pressure. The cost of this quantity of gas is 2s. 4d.; in other words, the light of barely 1000 candles is obtained for 1·04d. Each of the above burners is supplied with gas at a pressure equal to a 9-inch column of water. This raising of the pressure from 3 inches to 9 inches is effected by a patent automatic water compressor of small and simple construction. The act of turning on any lamp sets the compressor in motion; and, of course, it stops when the gas is shut off. The quantity of water used to compress sufficient gas to produce a light of 25,000 candles per hour is 193 gallons, the cost of which, at 9d. per 1000 gallons, is less than 2d. per hour. Consequently, the total cost of gas and water for this lighting will be 2s. 6d. per hour for a light equal to 25,000 candles. We venture to assert that this is by far the cheapest method of lighting large spaces which has yet been seen. The whole of the lighting has been carried out by Messrs. W. Sugg and Co., Limited.

GAS-ENGINES AS MOTIVE POWER IN ENGINEERING WORKS.

At the Meeting of the Manchester Association of Engineers last Saturday, Mr. A. R. BELLAMY (of Messrs. J. E. H. Andrew and Co., Stockport) read a paper on the above subject.

The author began by explaining that it was not his intention to discourse upon the merits of gas-engines as compared with other sources of power for all purposes. He simply desired to direct attention to the use of gas-engines for driving engineering works, as well as give some special information on this subject. He assumed that the question of cheap power applied to the driving of plant in workshops as much as to any other. It had been his earnest endeavour to obtain all the figures with the greatest degree of accuracy; and he had in all cases made the calculations against, rather than in favour of, his system.

Mr. Bellamy then proceeded with his paper, and said: Our factory is of very simple design, and therefore offers no difficulties in the distribution of the power. The works are divided into two shops joined to one another, and forming a covered floor space 408 feet long by 75 feet wide. The portion which we call the "old shop" is 288 feet long by 75 feet wide; while the "new shop" is 120 feet long by 75 feet wide. The "old shop" has two long lines of shafting running the entire length. One line of this shafting is driven on the east side by one of our 40 brake-horse-power "Stockport" gas-engines. The power is transmitted across the shop to the line of shafting on the west side by means of belts; the drive being divided half way. At this

point we have fixed fast and loose pulleys, so that the line of shafting on the west side can be be stopped when desired. From these two lines of shafting are driven all the countershafts for the tools in the main shop; also the machines in the pattern-shop, and the blower, &c., in the smithy. The total length of the main shafting is 563 feet, and varies in size from 1¾ to 3½ inches in diameter. It is carried in 83 bearings, fixed on brackets secured to the wall. The countershafts number 87, carried in 182 bearings; and the total amount of belting is 2500 feet, ranging from 2 to 5 inches in width. The tools driven from these two lines of shafting number 102; comprising lathes, drilling and shaping machines, grinding and emery stones, blower, &c.

The "new shop" is driven by a second engine of 40 brake-horse-power. This engine drives a countershaft which operates the dynamo, and also, by another belt, the line of shafting 60 feet long and 3 inches in diameter, with nine bearings carried from the wall by brackets on the east side. From this shaft power is taken by belts for turning six countershafts of a total length of 42 feet, with twelve bearings and 400 feet of belting from 2 to 5 inches wide, and the following fairly heavy tools: Two planing-machines, one fly-wheel turning lathe, one 5 feet radial drilling-machine, and one screwing-machine; making a total of five machines.

Taking first the old shop, the horse power absorbed by the friction of the engine and driving-belt on the loose pulley is 8·4; by the main shafting, with all the countershafts running, but with the machine belts on loose pulleys, 10·5; by all machines working in the ordinary daily routine, 17·75; by the grindstones and emery wheels, 8·2—total, 44·85. Taking the new shop, the horse power absorbed by the engine friction and the driving belt on the loose pulley is 8·5; by the countershaft for driving the dynamo, with the dynamo running light, 3·5; by the main shaft, with countershafts and all belts on loose pulleys, 2·2; by all the machines working in the ordinary way, and large fly-wheel lathe (three tools) roughing out, 7·8; by the 5-ton electric crane, average constant horse power taken from a series of tests, 1·8—total, 23·8.

Having described the method adopted for getting at the power, the author went on to say: Dealing first with the power for driving the works, we have in the old shop (say) 45 indicated horse power, and in the new shop (say) 24 indicated horse power, or a total of 69. The gas consumption worked out at the rate of 67 cubic feet per indicated horse power per hour. The costs were taken for an ordinary working week of 53 hours, with an allowance of one hour for the time the engines are running before and after shop hours. Therefore 69 × 67 × 54 equals a total consumption of 249,642 cubic feet—say 250,000 cubic feet—of fuel gas. Reckoning 14 lbs. of fuel per 1000 cubic feet, the coal used equals 3500 lbs., which at 25s. per ton amounts to £1 19s. Tabulating the total cost for one week, we have—

	£	s.	d.
Fuel	1	19	0
Labour (one man at 25s. per week)	1	5	0
Oil and waste for engines	0	4	0
Interest, depreciation, and repairs, at 10 per cent. on a capital outlay of £900	1	16	0
Total	£5	4	0

This is at the rate of a little less than 2s. per hour. Reducing the cost to a single horse power per hour, a total of 3726 horse-power-hours at a cost of £5 4s. is at the rate of ¼d. per indicated horse power per hour, which covers all charges. The cost of the fuel gas per 1000 cubic feet works out as follows:—

	£	s.	d.
Fuel per week, 3500 lbs., at 25s. per ton	1	19	0
Labour (half man's time) at 25s. per week	0	12	6
Interest, depreciation, and repairs, 10 per cent. on £400	0	16	0
Total	£3	7	6

As the total quantity of gas made is 250,000 cubic feet per week, the cost therefore works out to 3¼d. per 1000 cubic feet. It is only fair to say that one man could work a plant of twice the capacity; and in so doing the cost of labour would be materially reduced. Again, an addition of £100 expenditure would double the output of gas; so that the item for interest, &c., would be materially decreased.

In order to make a comparison with a steam-engine, I again take 3726 horse-power-hours for a total consumption of 3500 lbs. of fuel, which equals 0·939 lb. per indicated horse power per hour, and includes all stand-by losses. It may be said that the cost of the fuel per ton is very much higher than ordinary steam coal; but allowing it to be three times as costly, it then comes out at the equivalent of 2¾ lbs. per indicated horse power for 69 indicated horse power—a result which will compare most favourably with the best steam-engines of much greater power. We are, however, within measurable distance of making a better gas from the commonest form of slack, which will reduce the cost of fuel 75 per cent. But, outside the question of economy there are many other advantages over steam, among which are the following: Start at a moment's notice, no time lost in getting up steam, less stand-by loss, practically no smoke, less fuel to handle and little or no ashes to remove, great economy in water, no tall chimney to build, and no flues to clean.

The author next considered the subject from the electrical engineer's point of view, and then proceeded as follows: It may be argued that there would be an economy in splitting up the shop into sections, and driving each section by a separate motor, which would be coupled direct to the shaft. I have carefully studied this question, and have come to the conclusion that even then gas-engines would be as cheap and more advantageous. In place of each motor, you could instal a gas-engine; and the extra friction of the engine and belt would be little greater than the loss in the motor. Besides, with each gas-engine you would have an independent source of power, which is of itself very valuable. There is no method of distributing power with such a little loss as by gas. In a paper read by the late Mr. Denny Lane in June, 1893, he showed that one horse power employed at the gas-works would force through mains one mile long sufficient gas at 4 inches pressure to supply 3000-horse power.

In conclusion, Mr. Bellamy gave some particulars as to the cost of the electric light; the lighting of the works being at present a combination of gas and electricity. They have 19 arc lamps of 2000-candle power each, and 31 lamps equal to 16 candles each. The power used is 18 brake or effective horse power. Taking 83 cubic feet of fuel gas per brake horse power, and an average of 20 hours per week, the total consumption of gas is 29,880 cubic feet at 3¼d. per 1000—say, 8s. 2d. per week, or less than 5d. per hour for a total of 38,000 candles in arc lamps, and 496 candles in incandescent lamps. He also gave particulars of some recent trials of gas-producing plant and "Stockport" engines at the Dartford Iron-Works. The brake horse power of the two engines was 85·51; and the anthracite coal burned per hour to produce it was 0·655 lb.

In the discussion which followed the reading of the paper,

Mr. E. Constantine said he should like to know something as to the cost of the Dartford installation. The author had remarked, in comparing gas-engines with steam-engines, that at 2¾ lbs. of fuel per indicated horse power for 69 indicated horse power the former would compare most favourably with the best steam-engines of much greater force. This required qualification. With good compound steam-engines of greater power than that they could get a horse power at considerably less than 2¾ lbs. of coal; the pressure being 100 lbs. The question arose as to whether in a small shop it would pay to lay down a gas-generating plant.

Mr. A. Saxon thought the size of a works largely regulated the cheapness with which the plant could be driven. As to gas-engines, many people who had tried them asserted that they caused far greater trouble than steam-engines. The difficulty of starting was one of the things complained of. He must say, however, that the fact that Mr. Bellamy was driving with 69 indicated horse power at the rate of 2s. per hour struck him very forcibly, and represented a most creditable performance.

Mr. J. H. Stubbs said he had two works—one driven by steam and the other by gas. If he had to do the thing over again, he should certainly use steam at both places. He had a 25-horse power gas-engine at one of the works, and his experience with it had been a very sorry one. Mr. Bellamy said a gas-engine would start at a moment's notice; he (the speaker) found that it would stop with no notice at all. There was also great difficulty in keeping it in order; and whereas the steam-engine at the other works only cost about £20 for repairs in thirteen years, the gas-engine cost from £400 to £500 in six years. Although with gas-engines and a gas plant, there were no tall chimneys to build or flues to clear, there was a coke scrubber and also a sawdust scrubber to clean out every four or five weeks; and in place of the chimney there was a gasholder, which would take up much more room.

Mr. T. Daniels said his firm had for many years driven a part of their works by a gas-engine, and it worked very well. It was true it did not start at a moment's notice; but he understood that a new self-starter had been brought out since the engine his firm had put down was designed. As for stopping, it was about equal in this respect to a steam-engine. The man who attended to it also worked a screwing and a drilling machine. Gas-engines were very useful for driving certain divisions in engineering works.

Mr. S. Dixon said his experience of gas-engines was that they would stop at a moment's notice.

Mr. Furnival said where a firm had 70 or 80 horse power to give off, it was certainly economical to use producer gas for their engines; but for about 20-horse power they would scarcely be warranted in putting down a producer. They had been using a 25 brake-horse-power gas-engine in their works; and it caused no trouble at all. It started regularly every morning, and the man who set it going employed the rest of his time on a boring-machine. In another department of the works, they had a gas-engine which a labourer started every morning. He (Mr. Furnival) could fully bear out Mr. Bellamy's claims for the gas-engine.

Mr. Batis said they had had a gas-engine in their works for about three months, and the self-starter had not missed three times in that period.

Mr. Shaw said that, with a good self-starter, there was no trouble in starting. The gas-engine, however, did not stop immediately the gas was shut off. The results he had attained in gas-engine driving were very satisfactory; and he could thoroughly recommend this class of engine. Still, the steam-engine had its advantages.

Mr. T. H. Webb, of Liverpool, said he could speak highly of gas-engines he had had under his control. He had a 100 brake-horse-power gas-engine, and it worked out at just over 0·1d. per

horse power per hour with anthracite coal. They had also a small 4-horse nominal gas-engine, driving twelve machine tools, which also worked very well. They had taken out a steam-engine, and were effecting a saving of 50 per cent. They only cleaned the scrubbers twice a year. If they put on town gas in addition to their own, they would be able to clean the scrubbers out without stopping work. His experience was that there was a great saving in using gas instead of steam.

Mr. BARTLAM asked why, taking the case of Stockport, the Corporation, who were going to adopt electric lighting and were putting down high-pressure steam-engines and boilers, could not, seeing they could make good gas at about 6d. or 1s. per 1000 cubic feet, use gas-engines to generate the electricity.

Mr. MEUNIER, the Gas Engineer of the Stockport Corporation, said the consumption of 67 cubic feet of gas per horse power struck him as very low, because the gas was Dowson gas, and contained a large amount of carbonic acid, and they could not get the same power from it as from ordinary illuminating gas. For the latter gas nearly 25 cubic feet per horse power would probably be required. One difficulty with gas-engines arose from the fact that the "anti-fluctuating" gas-bags were frequently not anti-fluctuating at all. They often got a fluctuation of half-a-tenth, one, two, or four tenths, &c. This was a failing requiring attention. In one case, at a hat-works, the people were not getting from the gas-engine half the power they had obtained when it was first put down; and they also complained that the workpeople were being practically poisoned—some being taken ill, and others fainting in the place. At that particular time, the Corporation were preparing to start carburetted water-gas plant, and the people said they must be making the new gas and that this caused the poisoning. Of course, he knew that this was not the case. He found the cause was that the exhaust-pipe was blocked up, due probably to carelessness on the part of the workmen; and the half-consumed gas was escaping into the atmosphere, and deleteriously affecting the workmen. People who used gas-engines should study the cause of any defects or difficulties which arose, and try to remedy them. They would then find a gas-engine a more satisfactory motor than they had thought it to be.

Mr. BELLAMY, in his reply, said the installation, including two gas-engines and the gas plant at Dartford, would cost £1500. As to coal consumption, a Committee in Birmingham, the members of which visited various places, and tested what the steam-engines were doing, at from 5-6ths to 100-horse power, found the coal consumption from 3 lbs. to 23 lbs. per indicated horse power per hour. With Dowson gas at 3¼d. per 1000 cubic feet and a separate plant, they could generate electricity as cheaply as by any form of steam-engine plant. In fact they could do it as cheaply with a 100-horse power gas-engine as with a steam-engine of similar power. He would not recommend a fuel-gas plant for less power than a constant of about 25 indicated horse power. He might mention that Armstrong and Whitworths had 20 or 30 large gas-engines, and were still increasing their plant. In one shop where steam-engines had been dispensed with, the firm paid £1000 a year for a gas bill, and still found considerable economy in the change. He was prepared to say that the cost of keeping up the gas plant and engines at his works would compare with anything in the district. They cleaned the coke scrubber once in nine months, and the saw-dust scrubber once a month. As to self-starting, his firm's arrangement was remarkably simple, and it required something very odd indeed to prevent it from starting. He might say that with fuel gas they required four times the quantity needed with town gas; so that fuel gas at 3¼d. per 1000 cubic feet meant 1s. 1d. with town gas. By using fuel gas, they reduced the cost by two-and-a-half times. In other words, town gas at 2s. 6d. per 1000 cubic feet was two-and-a-half times as dear as fuel gas. Mr. Bartlam had raised the question: "If gas-engines are so suitable, why do not the Corporations put gas-engines down for driving dynamos for town lighting?" He thought the reason was largely that gas-engines took up more space, and also that greater power than manufacturers of gas-engines were at present able to give them was wanted. He might, however, say that at the Agricultural Hall in London there were 300-horse power of his firm's gas-engines driving dynamos; and they could make their electricity far cheaper than they could buy it on the most advantageous terms from the Islington Vestry. So long as the engine was adjusted properly, it would pay anybody to work with low-pressure as well as with high-pressure gas.

NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

Annual Meeting in Boston.

The Twenty-ninth Annual Meeting of this Association was opened on the 16th ult., under the presidency of Mr. S. J. Fowler, of Springfield (Mass.). The Treasurer's report showed a satisfactory condition as regards finances, and five active and three associate members were elected.

In commencing his Inaugural Address, the President referred to the thriving condition of the gas industry in their district. Electricity and oil were also doing well; and he thought that gas was especially making way with the poorer classes. The pre-payment meter was a great means of popularizing the use of gas in this direction in England, and might be so to some extent in America. But it was hardly possible that the use of gas would become as popular, and be employed for cooking all the year round, in their district, on account of the variations in temperature. He illustrated this point by a diagram showing the average temperatures over a twelvemonth at Leicester (England) and at Springfield (Mass.). In their climate, the kitchen could not be kept comfortable without heating arrangements; whereas in England there was so little variation of temperature that warmth in addition to that derived from the cooking-stove was not absolutely necessary. England was pre-eminently the country for great gas consumption; but different climatic conditions prevailed elsewhere, and these were beyond their control. The incandescent gas light was advancing in public favour; but looking at the fact that it was the cheapest and best-known means of lighting, he was disappointed that it did not advance more rapidly, especially for street lighting. While gas companies and local authorities might be partly to blame for this, he thought most of the fault must be laid at the doors of the Company who claimed to hold the master patents, and the subordinate companies. Some considerable progress had been made; and there was no reason why such progress should not continue along the same lines. Reference was next made to the works of the New England Gas and Coke Company, who aimed at producing a coke from soft coal which would compete on the market with the anthracite coal that was the staple fuel in their district. There were complaints as to the difficulty of selling gas coke; but he observed from the Massachusetts State reports, that the returns for residuals, as compared with the cost of coal, had nearly doubled since the issue of the reports was commenced. For one thing, the adoption of the generator system had resulted in a larger yield of coke for sale; and he found that it paid to sell as much coke as possible and to buy soft coal for boiler fuel, &c. The successful issue of the late war seemed to give an impulse to general business, which found particular expression in increased production of coal and iron, and a rise in prices of iron of every kind. This would render extensions in works and mains more costly, and put a check on new projects in that direction.

Mr. T. J. Hintze, of Malden (Mass.), related some of his experiences, under the title of "A Paper Unnamed." He mentioned that, having found that his unaccounted-for gas averaged 168,000 cubic feet per mile of main per annum, he thought it might be reduced, and last summer went carefully over 90 miles of main, of which about 70 miles was 4-inch and under. In all 243 leaks were discovered and repaired, at a cost of over £340. The work was completed last November; and he could already see that it was money well spent. He had introduced half-depth regenerator furnaces, with six retorts to a bench; and the results were very satisfactory. Having paid £240 per annum for water for many years, it struck him that this item might be improved on; and so he drove an artesian well and pumped his own water supply at a nominal cost. His store-tank was of 30,000 gallons capacity, placed on a tower 40 feet high; and he strongly advised all gas companies to pump their own water.

A paper on "High-Pressure Distribution" was read by Mr. B. J. Allen, of Brookline. He had two steel tank 3-lift holders of modern type, of 1 million and 1½ million cubic feet capacity respectively. The lifts of No. 1 gave 3, 4½, and 6¼ inches pressure; and those of No. 2, 4½, 5½ and 7¼ inches. The inlet and outlet pipes were 24-inch, and were connected up to common inlet collecting mains and common outlet collecting mains respectively. On the common outlet was a 24-inch Conelly governor, with a 30-inch bye-pass. In addition to this, a No. 9 Sturtevant blower, driven by a 40-horse power engine, was so connected up that it could draw from the common inlet, common outlet, or either of the two outlets, and deliver into the outlet from the governor. This system supplied six townships, including 258 miles of main, ranging from 24 inches down to 3 inches in diameter. The governor would supply the pressure desired during the day, so long as it did not exceed 4 inches. Sometimes at night, when both holders were full, a sufficient pressure could be obtained without the blower. But when they wanted over 5 inches at the governor outlet, it was necessary to work the blower. Sometimes they pumped gas from the light holder into the heavy one; and in the winter, when 6 or 8 inches pressure on the outlet was required, they pumped direct into the outlet—taking care to keep the heavy holder full, so that it would come into action in case of failure on the part of the blower. The system of working was amplified by the exhibition of some pressure diagrams. The advantage of using the blower was that it afforded them more liberty in the matter of storage. Before its introduction, it was necessary to have both holders full at dusk, if a proper supply was to be maintained; and this could not be guaranteed without keeping on extra retorts, damping down during the afternoon, and charging as soon as there was room for the gas. The blower did away with this trouble, and thus greatly improved the manufacturing results.

Discussion being invited, Mr. Gifford asked how consumers in the immediate vicinity of the outlet were affected; and Mr. Allyn said that 7 inches distributing pressure seemed very high. Mr. Sherman asked what percentage of the consumers came in for over 6 inches pressure. Mr. Shelton understood there was no automatic governor, but that the blower was regulated by hand. Mr. M'Gregor and Mr. Bradley had resorted to similar means for increasing the distribution pressure, with satisfactory

results. Other speakers recounted like experiences. Mr. Addicks, at the request of the author, described the arrangements adapted for equalizing the distribution pressure, by which any excess in the vicinity of the works was avoided. Mr. Allen, in replying, said that the system worked well. An automatic governor was of no use, on account of the variations in demand. They had communication by telephone with several parts of the district, and regulated the blower by hand according to information so obtained.

Mr. J. J. Humphreys, jun., of Worcester (Mass.), read a paper entitled "Notes on the Design and Extension of Gas Plant." He thought that the practice of building the works on the lowest level had often been carried to excess; too great a value being put upon the gain in distribution pressure so secured. The land selected was often a partly reclaimed swamp, with water close to the surface; necessitating a considerable expense for foundations, and leading to subsequent trouble from cracks and settlements. He advocated a site just outside the town, and if possible in the direction of the probable growth of the factory district. The ideal site was a gravelly ridge or knoll, close to a navigable river and railways, with water in the ground at least 20 feet below the surface. The works should be so designed as to admit of enlargement to four times the original size without disarranging the plan or throwing any of the buildings out of use. The plan of keeping all apparatus under one roof was a good one, for several reasons; but the building should be kept well away from the boundary lines, so as to leave room for expansion in every direction. All moving machinery should be kept as close together and to the boiler as possible, so that one man could attend to the whole. The same rule applied to water-gas sets. Coal and other material should be stored at the highest level, so that in working all full loads would run down hill. All buildings should be absolutely square one with another, and all pipes parallel to building lines. In buildings with cellars, the first-floor line should be kept at least 5 feet above the yard level; and eventual economy was best served by having all underground masonry and walls up to 2 feet above the ground level laid in properly-gauged cement mortar—two of sharp sand to one of cement. To protect the joints in the upper part of a building from weathering, he used half a barrel of cement to every barrel of lime in the mortar. Walls likely to be displaced for extension, should be only 12 inches thick, stiffened by pilasters where necessary. Gasmen were a long way behind the times in the matter of coal storing. There was some excuse for shallow piles in the case of coal liable to spontaneous combustion; but other kinds should be stowed in a modern steel-frame hopper-bottomed coal-pocket, divided into bins about 20 or 25 feet deep, having a capacity of 100 to 500 tons per bin. In this way, different sorts of coal could be kept separate, shovelling would be avoided, and stock taking facilitated. Retort-houses should be well ventilated and high roofed; and the benches should be back to back, with plently of room in front. For hand stoking, he preferred eight retorts per bench, with arches high and wide enough to allow free circulation between the retorts, and heavy enough to reduce loss by radiation to a minimum. But the retorts and partition walls should be as light as consistent with the required amount of strength. If the regenerator system was used, he preferred half-depth, as he doubted whether the slight additional saving due to a full-depth furnace was sufficient to cover the extra cost. Furnaces should be of ample size, as a small body of fuel was not necessarily more economical than a large one. Almost any method of enriching with oil was better than that of spraying it into the retorts by means of steam. Using half a gallon of oil per 1000 cubic feet of gas, without steam, he had been able to increase the yield 600 to 800 cubic feet per mouthpiece. In a combination plant, the water-gas house should be close enough to the retort-house to get the benefit of hot coke from the generator, as this meant an economy of from 2 to 3 lbs. of fuel per 1000 cubic feet of gas. The present tendency in steam practice was toward higher pressures; and this must be borne in mind when designing new plant. He preferred low-speed engines to high-speed ones, but had a great regard for the future possibilities of a direct-coupled steam turbine. Blowers should be strong enough to give high pressure if desired; but it was more economical to blow a greater volume of air at a lower pressure. He advocated generators of sufficient depth to take a fuel-bed 9 feet deep, and also a valve between the wash-box and scrubber. Lack of condenser capacity was a common fault; few plants putting the gas into the relief holder below 100°. A water-gas condenser made a good preliminary feed-water heater; or condensers could be cooled by air driven by rotary fans or blowers, at a very low cost. While all machinery and boilers should be under one roof, there should be no door or other direct communication between the boiler or blower room and the exhauster and oil-pump room. For boilers, he preferred the ordinary well-made tubular boiler, with plenty of steam-space and well bricked in. The purifiers should be large, and lined with cement on bottom and sides, and preferably overhead, so as to leave free access to valves and connections; and the space below could be used as the revivifying floor. Tar or liquor wells should be a safe distance from the coke-yard; and gasholders might be fitted with guide-framing heavy enough to admit of being raised to three lifts when required—the bell itself being simply the top section. By this plan, the storage could be doubled or trebled at any time without throwing the holder out of use. He considered that flat-bottomed tanks were more likely to keep tight than where a central cone was left. For steel tanks he preferred a concrete bottom, strengthened by heavy steel net imbedded in it; and the guide-framing should be as simple as possible, as the positive protection of latticed columns from rust was a difficult matter.

(To be continued.)

THE FUTURE OF WATER GAS.

The appearance of the report of the Departmental Committee appointed by the Home Secretary to investigate the manufacture and use of water gas will have drawn a large amount of attention at the present time to that gas. We may very appositely therefore now relate the views of Herr H. Croissant, of Ludwigshafen-on-Rhine, on "Novelties in and the Future of the Water-Gas Industry," as gleaned from a recently published paper which was read by him at last year's meeting of the Mid-Rhenish Association of Gas and Water Engineers. At a moment when it is proposed to control, and perhaps to fetter, the water-gas industry in this country by restrictive legislation, information such as that collected by Herr Croissant acquires an enhanced value.

A comparison of the two methods of obtaining gas from coal indicates that the essential difference is that coal-gas manufacture is a distillation process and water-gas manufacture an oxidation process. Certain descriptions of coal, however, are required for making coal gas; whereas any coal, anthracite, or carbon, will yield water gas. The distillation process demands exclusion of air, and consequently separation of the heating and distillation chambers; but the oxidation process calls for the presence of oxygen, and therefore the heating and gas chambers are one, and the generator is a simple square or round shaft with or without a hearth. As generators of a productive capacity of 21,000 to 25,000 cubic feet per hour are now constructed, one such generator will yield gas equal in illuminating value to the coal gas from six to eleven settings of nine retorts—assuming that incandescent burners are used in both cases. The heating value of the water gas from such a generator is about the same as that of the coal gas from three or four such settings. The introduction of the Welsbach mantle first gave water gas the promise of a brilliant future; and thereafter both in the manufacture of the gas, and in the methods of its application to lighting, immense strides have been made.

Water gas, which is a mixture of carbonic oxide and hydrogen, with small quanties of carbonic acid, nitrogen, and oxygen, is obtained, as is well known, by passing steam through incandescent carbon. But good gas is obtained at a high heat only; because the temperatures of dissociation of steam and carbonic acid are very high. The decomposition of steam absorbs heat; and consequently after a period of gas making, the introduction of steam must be discontinued, in order to raise the temperature of the generator by the combustion of some of the carbon by means of an air-blast. Endeavours have therefore been directed, in the first place, to extending the runs or periods of gas making, and to curtailing the blows or periods of blasting; in the second place, to producing water gas only and no producer gas as a bye-product; and in the third place to raising as much as possible the efficiency of the generator. The heat consumed in the generator is, however, proportional to the gas production; and consequently if the blows are curtailed and the runs extended, more heat must be liberated during the short blows. There are two feasible methods of increasing the amount of heat developed during the blows. The first of these is followed in the Dellwik process, in which the products of the blow contain not less than 13 per cent. of carbonic acid. In place of making producer gas and thereby liberating 2470 units of heat per unit weight of carbon consumed, as in the usual process, the products of the blows in the Dellwik process are carbonic acid and nitrogen; and there are liberated 8080 units of heat per unit weight of carbon consumed. The second method of increasing the development of heat has been patented by Dr. Strache. It consists in forming producer gas during the blows; and using the producer gas to heat the steam and air which are supplied to the generator. Theoretically this process develops the same amount of heat in the generator as does the Dellwik system. The producer gas is consumed in regenerating chambers attached to the generator; and the steam and air are subsequently passed through these chambers, and highly heated before entering the generator.

By both methods, the bye-product, producer-gas—for which there was rarely any use—is done away with. Prolonged runs mean great productive capacity for a generator of given dimensions; and therefore the losses by radiation, &c., are diminished per 1000 cubic feet of gas made. The Dellwik generator is of as simple construction as the old type of generator; and the working is also simple, and quite free from danger. Dellwik water-gas plant should be no more expensive than Dowson gas plant. The Dellwik plant yields from 38½ to 40 cubic feet of water gas per pound of carbon consumed (including the fuel used in steam raising), and thus renders from 72 to 76 per cent. of the heat of the coal available in the water gas. So high an efficiency is not equalled by any steam-boiler. The illuminating value of the water gas thus obtained from one pound of carbon is from 600 to 800 candle-hours. The gas has a calorific value of 69 to 72 units of heat per cubic foot.

In order to secure a good make of water gas with the Dellwik

generator, the coal must be completely consumed during the blows, so that the exit gases contain the maximum proportion of carbonic acid. So far, however, it has only been found possible to use coke in the Dellwik generator; while with the Strache generator any description of coal can be used. At the top of the Strache generator is a chamber in which the coal is first distilled. The volatile products of distillation mix with the superheated steam, and pass over the fuel in the lower part of the chamber, where they are decomposed into hydrogen and carbon. The hydrogen mixes with the water gas which is simultaneously formed. The carbon liberated appears to be useless for water-gas production, as it is found afterwards as dust in the scrubbers. The Strache gas is richer in hydrogen than ordinary water gas; and is consequently more valuable for illuminating purposes. About 66 per cent. of the heating value of the coal is rendered available in the gas. There is a loss of about 12 per cent. in the carbonaceous deposits in the scrubbers; but probably this very large loss might be diminished by an improved construction of the apparatus. The fact that any description of coal may be used renders the Strache system peculiarly suitable for use in places where the only readily available fuel is coal of poor quality. The Strache plant is, however, more complicated and more expensive than the Dellwik plant. But the author can testify that both these plants behave well; and can be rapidly brought from the cold to the proper heat for gas making.

The advances which have been made in the utilization of water gas deserve attention. By means of suitable burners, water gas, on account of the high temperature of its flame, gives a much higher illuminating effect with Welsbach mantles than coal gas. Dr. Strache's water-gas burners, in five different sizes, afford a duty of 14·6 to 20·7 English candles per hour, according to his own tests. Last summer the author examined the burners at Dr. Strache's experimental plant at Mödling—which plant was removed later to the Vienna Hospital—and is able to testify that the duty of the burners has not been overstated. He can also bear witness that the water-gas light is far more brilliant and of warmer tint than the coal-gas light, which appears dull and dead in comparison. The water-gas light does not alter the natural tints of coloured articles. The workshop at Mödling was lighted by a cluster of water-gas lights of 900 to 1000 candle power at about half the cost of an electric arc light. The author also examined the behaviour of the Fahnehjelm combs, and was convinced that they would satisfactorily replace the ordinary open-flame gas-burners, which consume so much gas, and evolve so much heat. Dr. Strache's present burners are not of the atmospheric type; and doubtless an increased illuminating duty will be obtained by the use of suitable atmospheric burners with water gas. The small consumption of gas per burner causes little vitiation of the air; and the heat evolved is about one-third that from coal-gas Welsbach lights of the same candle power. Hence, hygienically, water gas ranks superior to coal gas.

At Mödling, the author convinced himself that the odorization of the gas by means of carbylamine was so efficient that the slightest escape could be at once detected by the smell. In 1897, the author visited the earlier water-gas works at Radkersburg, in Styria. The plant is on the old system, and therefore the gas is comparatively costly; but it has given the greatest satisfaction during the number of years in which it has been supplied to the town. Gas is usually made only during the hours of consumption; at other times the man in charge of the plant and his two assistants are occupied in renewing mantles, &c.

The new water-gas processes give a higher duty, so far as the conversion of the energy of the coal into light and power is concerned, than is obtained when the coal is used to produce either coal gas or steam. There appears, however, to be opportunity for still further improvements, which should render the water-gas process far ahead of all others for the utilization of the energy of coal. In the Dellwik process, the heat of the spent gases should be utilized; while in neither the Dellwik nor the Strache process is the heat which is carried off in the water gas in any way recovered. More thorough regeneration of the heat is needed in order to increase the duty. The combustion of water gas with Welsbach mantles even now affords an enormously high illuminating duty from the coal. Thus by the water-gas Welsbach light 1000 candle-hours are obtained from 1¼ to 1¾ lbs. of coal; while the same number of candle-hours are produced by the electric arc light from 5 to 7½ lbs. of coal, and by the coal-gas Welsbach light from 7½ to 8½ lbs. of coal. Therefore, from the standpoint of national economy, water gas claims attention. In addition to the high duty obtained from the coal, the water-gas process is advantageous because of the low expenses of production. Wages and capital charges are both lower than for coal-gas works of equal capacity. It appears logically incorrect to carburet water gas, by a fixing process; because even now coal gas is disillumined in most of its applications, and to render a gas which is specially fitted for the development of light by incandescence a luminous gas which will be again disillumined in use, seems the height of absurdity. The process also becomes dependent on the price of oil for its economical success. Coal gas depends largely on the value of the bye-products, and the prices of these show a continually downward course; so that a water-gas works which is entirely self-supporting affords a much more reliable investment than a coal-gas works at the present time.

Similar objections are now raised against water gas to those which were raised forty or fifty years ago against coal gas. Some dangerous property of the novelty in each case has been seized upon; and the possibility of accidents happening therefrom has been made much of. But every technical innovation has some attendant risk, which is, however, minimized partially by technical precautions, and partially by the advance in intellect of the public who adopt the novelty. Thus the innovations tend ultimately to further, both economically and hygienically, the welfare of mankind. Water gas is more poisonous than coal gas; but sound mains, adequate odorization, and perhaps also appliances which give warning when taps are left open, and automatic igniting devices, will make water gas no more dangerous than coal gas is under the present conditions. An incident in the author's experience, in the autumn of 1897, will illustrate the advantages of gas being possessed of a very penetrating odour. Circumstances on one occasion led to coal gas being supplied for a short period in an unpurified state and carburetted with impure materials, and complaints were received at once from numerous houses in the district supplied of strong smells of gas. The fact was the services in many houses were old and leaky; but the escape of properly purified gas had not been detected by the inmates. Hence the advantage of supplying strongly-smelling gas for a time was that many leaky services were overhauled. Now, artificially-odorized water gas could not escape from leaky services without being detected, for the odour of mercaptan or carbylamine (one of which substances is used to odorize water gas), would render the air of rooms into which gas was escaping quite unbearable.

The risk of explosion is less with water gas than with coal gas because the burners used have a smaller rate of delivery, as the consumption of gas is less; and therefore an open tap would not so rapidly render the atmosphere of a room explosive. Though naphthalene has given trouble in carburetted water-gas installations, it has never been observed with uncarburetted water gas or Dowson gas. Though the consumption of water gas per burner would be less than the present consumption of coal gas so far as lighting is concerned, the consumption for heating purposes would be greater. Moreover, water gas would, on account of its cheapness, be much more largely used in motors. So soon as the worth of water gas has become generally recognized, and the expiration of the patents for the processes allows free play to competition, water gas will not only compete with coal gas, but will be used in place of steam or coal gas as a source of power. The author is of opinion that after electricity, which is far too expensive for general use, water gas is the best illuminant; while it can be produced so cheaply that in comparison coal firing for either cooking or furnace use will be dear. Incidentally also the general use of water gas will do away with the contamination of the atmosphere by smoke. To sum up, the conclusion must inevitably be drawn that water gas will be the universal source of energy in the future.

John Wright and Co., Limited.—The ninth annual meeting of this Company was held last Thursday, at the Grand Hotel, Birmingham—Mr. S. Sanders in the chair. In moving the adoption of the report, the principal items in which have already been given (*ante*, p. 617), the Chairman referred to the unbroken record of prosperity which the Company had had from the commencement, and expressed the hope that it would be continued in the future. Mr. J. F. Wright seconded the motion, and it was carried. The dividends recommended (6 and 10 per cent. on the preference and ordinary shares, and a bonus of 5s. per share on the latter) were declared.

Further Improvements at the Leeds Corporation Gas-Works.—At the meeting of the Leeds City Council last Friday, Alderman Lowden brought forward a resolution authorizing the Gas Committee to purchase some cottages, a joiner's shop, and other premises adjoining the Meadow Lane Gas-Works, for the sum of £5400, inclusive of costs, and of prospective damage. He explained that the Committee had resolved to specify distinctly the work which it was proposed to carry out; for it was impossible for them to manufacture gas or treat residuals on this land, unless they obtained an Act of Parliament. The extra space was needed for improved ventilation. The resolution was carried. The Council also authorized the Gas Committee to form a reserve fund, to be called the "Gas-Works Depreciation Fund," and to transfer to it £10,000 from the existing surplus profits.

Proposed Gas-Works for Freshwater and Totland.—Colonel Yorke, one of the Board of Trade Inspectors, held an inquiry at Freshwater (Isle of Wight), last Friday, respecting an application by the Freshwater Gas Company for a Provisional Order to authorize them to erect gas-works at the Norton end of Yarmouth, for supplying the parishes of Freshwater and Totland with gas. Mr. H. C. Damant, in support of the application, said there was an urgent necessity for lighting the district, which in the summer had a resident population of above 5000. At the last moment, the electric light had been mentioned; but there had been no application for an Order, and the matter was very much in the clouds. It was an utter impossibility to supply a large straggling district like Freshwater and Totland with electric light at a reasonable price. He characterized the objections as being purely sentimental and thoroughly frivolous. The whole of the public bodies concerned were in favour of the scheme. Mr. E. H. Stevenson, the Engineer, outlined the scheme, and added that it was impossible to supply the district with electric light at a profit if the price were not more than 7d. per unit. Mr. Wilson, on behalf of certain residents, said they were opposed to having an objectionable manufactory planted down at their doors which was intended to benefit a district two or three miles away. It was also asserted that the works would be prejudicial to the yachting interest, which had become popular in the district. The inquiry lasted three hours.

REGISTER OF PATENTS.

Producing Acetylene.—Hviid, L. P., of Copenhagen. No. 5497; March 5, 1898.

This invention has for its object to prevent certain inconveniences that have been found to arise in the usual methods of generating acetylene. Ordinarily, water alone, or solutions or mixtures of hygroscopic salts, have been used as decomposing liquids; while other inventors have proposed to use with the water spirits of wine, glycerine and other bodies inert with respect to the carbide. It is, however, a well-known fact, says the patentee, that by using water the process is most irregular, whereas when solutions of hygroscopic salt, mixtures of water and spirits of wine or glycerine and the like, are used, "it offers a more uniform though not more constant process, as the action grows fainter when by degrees the water it hitherto contained is consumed, as the inert materials remain present to the same extent, whereas the water is consumed; so that the time will come when the process ceases altogether."

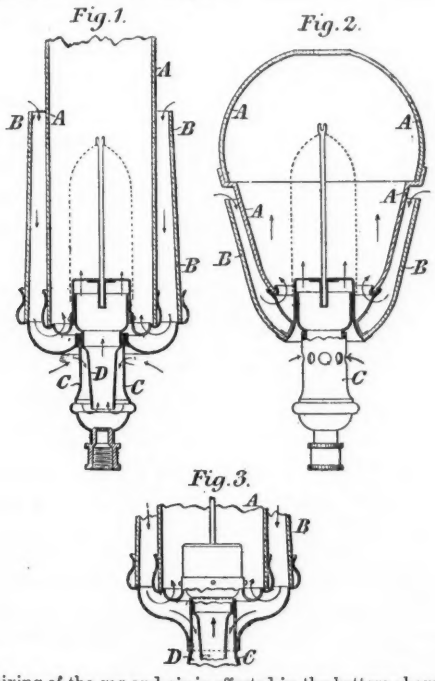
To avoid this the patentee proposes to use a saturated solution of sodic chloride, which it is claimed possesses several advantages over other solutions. The strength of a saturated solution of sodic chloride is always the same, however much water may be used, as the sodic chloride is set free when the water is consumed and the free chloride in the form of powder is precipitated immediately together with the calcic hydrate formed. He does not use raw carbide, but carbide moistened with petroleum or a mixture of mineral oils; and to the mixture is added an odorous inert oil—such as oil of roses. This moistening is "to fit the carbide for use in the household, as the carbide so prepared can be kept in the open air, and thus become an object for retail sale. Besides the carbide has then a very agreeable smell, which is of great importance as regards the extent of use of the material."

Under this process of producing acetylene, the following chemical reaction takes place: The water contained in the solution of sodic chloride splits the carbide into calcic hydrate; and acetylene and sodic chloride are precipitated. The free calcic hydrate and the sodic chloride sink to the bottom of the generator, whence it can be subsequently removed. The surface of the calcium carbide is maintained fresh, and surrounded by a saturated solution of sodic chloride, as long as gas is produced. As soon as the liquid has left the carbide, the production of gas ceases almost immediately.

Incandescent Burners and Lamps.—Schultze, K., of Berlin. No. 20,756; Oct. 1, 1898.

This is an attempt to apply the regenerative system to an incandescent burner with mantle of any ordinary type; the principal claim advanced by the patentee being for the construction of a lamp "the burner of which has a central tube inserted in its comparatively long burner-tube, by means of which central tube the air of combustion entering through the upper apertures of the burner-tube is subjected to a preliminary heating when flowing in a counter-current to meet the gas, while the mixture of gas and air is afterwards separately heated inside the central tube."

In fig. 1, the central tube D is inserted into the burner-tube C; while the latter carries at its top the burner-head supporting a cap, the burning surface of which is provided with very fine perforations. The central tube forms an extension of the burner-head, and ends close above the nozzle; while the apertures at the sides for admitting air are made just opposite the beginning of the true central tube. The tube C is fitted, opposite the end of the tube D, with a boss by which it can be moved up and down on the nozzle, for the purpose of regulating the proportion in which the air is mixed with the gas, and of adjusting the proportion so as to prevent any excess of air entering, beyond the quantity required for the complete combustion of the gas.



The mixing of the gas and air is effected in the bottom chamber of the tube C, and the mixture of gas and air, being strongly heated and ascending inside the central tube, will, in consequence of its considerably diminished specific gravity, assist, by its own power of suction, the similar action of the gas-nozzle with reference to the air, so that the lamp may, it is said, be worked at considerably less gas pressure than is required with the ordinary bunsen burners.

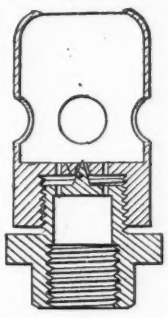
Fig. 1 shows the lamp with a cylindrical enclosing glass globe A; and fig. 2 the same with a pear-shaped globe. B is the exterior globe, supported by a solid disc or plate (for distributing the air) attached to the burner-tube, and carrying the gallery which holds the cylinder A.

The perforated surface of the burner-head, over which is placed the incandescent mantle, is formed by a cap, which sits loosely, as a separate part, upon the burner-head, and can be removed from the head or from the burner together with the incandescent body and the cylinder. In fig. 2, the cap is enlarged at the lower end, like a gallery, and carries the outer globe, in addition to the pear-shaped enclosure, so that the whole may be taken off together.

The patentee remarks that it is not absolutely necessary that the air which flows through the annular channel between A and B, and is heated therein, should enter the cylinder or globe in its entirety—that is to say, flow to the outer surface of the incandescent body; but it may be partly led direct into the burner, and be again heated therein. With the lamp shown in fig. 3, an arrangement of this kind is employed. Here the disc for the distribution of air is extended below the apertures for admitting the air into the burner-tube C; so that only part of the hot air flowing through the upper annular channel enters the cylinder A, while the remainder reaches the burner-tube, where it mixes with the gas. The already strongly-heated mixture of air and gas is thereupon again heated in the central tube D to a maximum temperature.

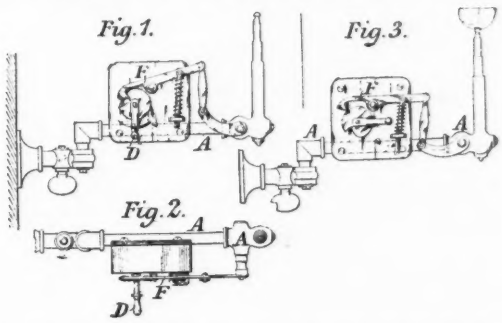
Incandescent Gas-Burners.—Griffin, A. B., of Verona, N.J., U.S.A. No. 25,654; Dec. 5, 1898.

The patentee proposes to form an incandescent burner as shown in the illustration—with a floor or bottom, above which are air-ports. The burner pillar is interiorly threaded below the floor, and screws upon an exteriorly threaded base adapted to be secured to the gas-pipe. Upon this base is carried a cone-shaped needle point, which registers in a central perforation in the floor. The floor is also pierced with one or more small supplemental perforations between the central perforation and the circumference of the floor. The base is also perforated to permit the flow of gas from the supply-pipe. The effective size of the perforation in the floor (and consequently the flow of gas through it) may be regulated by turning the burner-pillar up or down on the threaded base, as may be required by variations in the quality or pressure of the gas supplied. The stream of gas passing through the opening around the needle point expands into the shape of an inverted cone, the base of which impinges against the wall of the burner-pillar at a point above the air-ports. The fine streams of gas from the side perforations pass directly upward and strike against the sides of the cone of gas from the central orifice, at a point some distance from its apex, "in such manner that their impact thereon, while not changing its general shape, interferes with the impingement of the base of the cone against the walls of the burner-pillar, and prevents any noise arising therefrom." At the same time, the added streams of gas passing by the air-ports tend to assist in the induction of air through them, and its thorough commingling with the gas in the burner-pillar. The auxiliary perforations serve as a bye-pass for a flash-light if needful.



Time Apparatus for Extinguishing Gas.—Barnikel, P., of Brooklyn, U.S.A. No. 25,750; Dec. 6, 1898.

The invention consists in a combination with a gas-bracket of (1) an auxiliary stopcock, (2) a clock-train supported on the bracket, (3) means for winding up the clock-train, (4) a notched disc on the main spring arbor of the clock-train, and (5) mechanism between the notched disc and the auxiliary stopcock, by which the latter is automatically closed and the light extinguished as soon as the clock-train has run out.



When the attachment is in its normal position of rest (as shown in fig. 1), the auxiliary stopcock A is closed, and the fulcrumed lever F rests, by the projection at its end, in the notch of the disc. When it is desired to light the burner, the notched disc is turned by its crank handle D in the direction shown by the arrow, so that the projection at the end of the lever F rides on the circumference of the disc, and assumes the position shown in fig. 3. By the intermediate connecting mechanism between the lever F and the crank of the auxiliary stopcock, the latter is thus opened, so that the burner can be lighted. As soon as the crank handle D is released, the clock-train is operated by its main spring, which has been wound up to a certain extent by turning the disc. According as the disc has been turned more or less, the clock-train will run for a greater or shorter length of time, until the notch of the disc again arrives below the projection on the lever. Then the latter, under tension of its spring, reengages the notch of the disc, and closes the auxiliary stopcock—so extinguishing the flame.

Controlling and Lighting Devices for Gas-Burners.—Knopp, W., of Berlin. No. 26,235; Dec. 12, 1898.

This invention relates to means by which gas issuing from burners of all kinds may be exactly regulated, by making the outlet opening of pointed conical form, which can only be opened or closed gradually by a thin pointed part displaceable vertically.

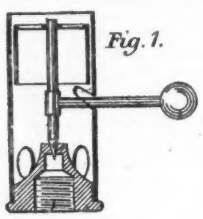


Fig. 1.

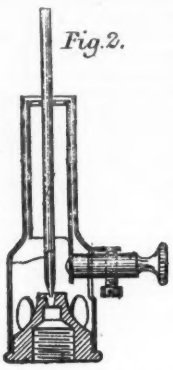


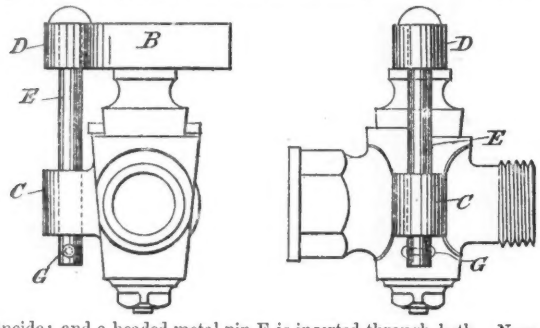
Fig. 2.

In fig. 1 the outlet is closed by means of a pin, guided above by a short cylindrical tube, capable of vertical displacement within a tube arranged upon the burner itself. This displacement is effected by an oblique slot, in which works an arm surrounding the pin; while the outer extremity terminates in a knob. According to the extent of the lateral displacement of the arm in the slot the size of the outlet is regulated.

The vertical displacement of the pin may be effected in other ways—see fig. 2. If the burner-tube is prolonged downwardly upon one side, and is there provided with a cross-piece through which a set-screw passes and bears against a projection from the inner tube, thus limiting the rise of the pin, the descent of the pin is limited by its encountering the sides of the aperture. This form of burner differs from fig. 1, owing to the fact that the closing pin is replaced by a fine tube. The centre aperture is thus never completely closed, as even if the point of the pin has entirely entered the conical aperture, gas is still able to escape upwards through the tube. The arrangement is such that the gas issuing at the upper extremity of the pipe is ignited by the flame burning upon the aperture, between two concentric tubes, at the moment when the supply of gas to the flame proper is interrupted by the descent of the central pipe.

Locking Taps and Cocks.—Settle, T., and Padfield, W. A., of Exeter. No. 26,548; Dec. 15, 1898.

This locking tap for use with penny-in-the-slot gas-meters is shown in the engraving. On the side of the barrel is cast a boss C, bored through vertically. The plug bar B is formed with an enlargement D at one end, which is also bored through. When it is desired to lock the tap, the plug is turned off, so that the holes in the enlargement D and the boss C



coincide; and a headed metal pin E is inserted through both. Near the bottom of the pin is a transverse hole, in which a soft metal pin G is inserted; and both ends of this pin are then riveted by means of a suitable appliance, which will also produce a certain mark on the riveted ends of the pin. In this way, the tap will not only be locked securely, but means will be provided for the detection of any tampering with it.

Automatically Conveying Coke from Retorts to the Coke-Yard.—Kellner, F., of Mülhausen, Germany. No. 27,523; Dec. 30, 1898.

This invention relates to an automatic coke-conveyor, the main feature of which is a suspended rail which extends horizontally in front of the retorts, while it traverses the yard with a downward slope, and finally rejoins itself at its starting point. Suitable tilting carriages are

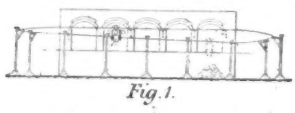


Fig. 1.

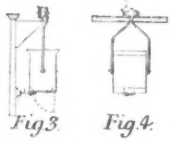


Fig. 3.

Fig. 4.

Fig. 5.

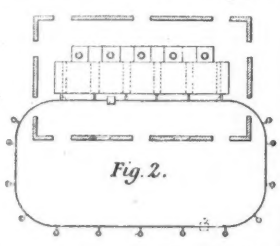


Fig. 2.

arranged to travel along its horizontal portion, for the purpose of collecting the coke; and then automatically pass through the yard down the gradient, and discharge the coke in the yard—returning to the horizontal part of the track.

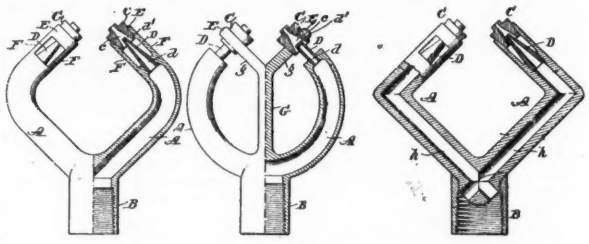
Figs. 1 and 2 are an elevation and plan of the arrangement; while figs. 3 to 5 represent the mechanism for discharging the trolley.

The rail, supported by pillars in the coke-yard, and secured to the retort-ovens by brackets, forms a closed-in line (or circuit), as already stated. For the purpose of collecting the coke, the tilting trolley is moved along the retorts—*i.e.*, the horizontal length of rail. Then, owing to the dip, it runs through the yard, and is discharged by coming in contact with a stop on one of the pillars. It next traverses a portion of the return up-gradient; and lastly it may be helped on to the horizontal stretch of rail again.

The trolley is supported on guide-rollers, and is fitted with a hinged bottom, which is normally kept closed by a bell-crank lever. Before the end of the dip of the rail is reached, the stop projecting from one of the pillars strikes the long arm of the lever, and turns it on one side a sufficient distance to cause the bottom trap-door to open and the coke to be discharged.

Gas-Burners.—Dolan, E. J., of Philadelphia, U.S.A. No. 253; Jan. 5, 1899.

This is an acetylene burner; and three forms of it are shown in the engraving—all of "duplex" type, with arms provided with tips arranged at an angle to one another, so that the jets projected from them will meet and form a flat flame at a slight elevation above the burner.



A are the hollow arms of the burner, branching from the cylinder B, and having ends directed toward one another. C are the outer combustion tips carried by thimbles E, supported by the burner body, and arranged at an angle to one another. D are the inner supply tips carried by the arms A, and located in the rear of the tips C, into the back of the passages of which they project. The supply tips D are provided with gas passages communicating with the passages in the arms A, and terminating in contracted orifices.

In the first and third constructions, the thimbles or supports E, which carry the outer combustion burners, are connected with the arms A by pieces F, which are shown as small strips, forming an integral connection between the thimbles and arms. They may, however, be separate attached pieces or brackets. In the other construction shown, the thimbles or supports E are formed in branching arms of a bracket G, carried by the body of the burner. In all cases the combustion tips are arranged in supports carried by the main body of the burner, and are independent of the supply tips D.

APPLICATIONS FOR LETTERS PATENT.

4255.—Windham, F., "Acetylene lamps." Feb. 27.

4284.—Porri, L., "Regulating device for gas-taps." Feb. 27.

4309.—Abel, C. D., "Feeding furnaces, and removing ash and clinkers." A communication from the La Compagnie Anonyme Continentale pour la Fabrication des Compteurs a Gaz et Autres Appareils. Feb. 27.

4314.—Lane, H., and Daulton, G., "Gas-burners." Feb. 27.

4319.—Hannay, J. B., "Burners for incandescent gas lighting." Feb. 27.

4324.—Bilbie, J., and Drivet, H., "Acetylene generators." Feb. 27.

4341.—Glover, R. T. & J. G., "Coin-freed gas meters." Feb. 27.

4365.—Wigham, J. R., "Burning acetylene gas." Feb. 28.

4488.—Thomson, R. K., "Gas or other engines." March 1.

4495.—Boult, A. J., "Manufacture of water gas." A communication from E. Fleischer. March 1.

4509.—Hawes, M. H., "Incandescent gas-mantle support and deflector." March 1.

4513.—Darby, H., W., & I., and Punchard, J. H., "Circular flame gas-burners." March 1.

4521.—Perrin, L., "Generating acetylene gas." March 1.

4550.—Potter, W. G., "Hollow mantle spreaders and argand burners for argand and incandescent lighting." March 2.

4560.—Haws, J. R., "Acetylene gas-lamps." A communication from R. C. Haws. March 2.

4561.—Potter, W. G., "Windproof cups and globes for incandescent and other burners." March 2.

4567.—Beard, A., and Beardmore, A. E., "Utilization of gas for the combined purpose of heating low temperature furnaces and the like, and producing a high temperature for heating steam-boilers or other purpose." March 2.

4581.—Jackson, J. P., "Manufacture and storage of acetylene gas." March 2.

4589.—Hentze, O., and Müller, H., "Producing hard mantles or hoods for incandescent light." March 2.

4602.—Eisenhuth, J. W., "Air and gas engines." March 2.

4603.—Harding-Lancaster, J., "Acetylene lamps." March 2.

4608.—Koblenzer, M., "Incandescence bodies or mantles for gas-lamps." March 2.

4719.—Fiaux, J., and Jsoz, C., "Production of gas." March 3.

4725.—Howard, A., "Incandescent lamps of glowing refractory substances." March 3.

4738.—Green, H., "Prepayment meters." March 3.

4742.—Colman, H. G., "Manufacture of coal and other illuminating gas." March 4.

4749.—Dent, C. H., "Moveable mantle cover for chimneyless incandescent gas outside lamps." March 4.

4751.—Rowbotham, W., "Acetylene generators." March 4.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Mr. A. E. Broadberry and the Water-Gas Committee's Report.

Sir,—I was pleased to see in your last week's issue that Dr. Haldane has favoured us with a letter which seems to considerably lessen the case against water gas.

I had compared the San Francisco figures of Table I. with Tottenham experience, without making any allowance for the difference in the proportion of water gas. I did this purposely, for two reasons—firstly, because I do not believe in Dr. Haldane's "cube" rule; and, secondly, because I wished to deal with the figures in just the misleading way in which they would probably be taken by the majority of those they were intended to guide. In his letter, Dr. Haldane admits that my figures would dispose of the idea that the risk in using water gas here is in the same degree as in America, if my figures were correct; but he brings them down from 59 to 3, and says there is no significance in our missing the 3. I should like him to show us how he does this.

I have tried by his rule, to which he refers, to reduce 59 to 3; and I will give him my figure. Perhaps he will show me where we disagree. Tottenham gas contains 50 per cent. of carburetted water gas; and that of San Francisco, 70 per cent. Taking coal gas at 7 per cent. carbonic oxide, and water gas at 26 per cent. (Dr. Haldane's figures), the Tottenham carbonic oxide would be $\frac{50\times7+50\times26}{100}=16{\cdot}5$, and that of San Francisco $\frac{30\times7+70\times26}{100}=20{\cdot}3$. The "relative increase" is thus $\frac{20{\cdot}3}{16{\cdot}5}=1{\cdot}23$; and 1·23 cubed is 1·86. So the risk at San Francisco is less than twice that at Tottenham; and so far from reducing 59 to 3, I make it $\frac{59}{1{\cdot}86}=31{\cdot}7$. Has Dr. Haldane made a mistake in placing his decimal, and thus divided by ten?

I notice, however, that I did make a mistake, against my own argument, in arriving at the figure 59. I obtained this by dividing 940, given in the table, by 16—our total output in the past 4½ years having been one-sixteenth of the standard London yearly output on which the table is based. But the 940 is in the "population" column; and our population is about 200,000, against the 6,000,000 standard for London in the table, or one-thirtieth. This would give us 31·3 deaths per year, or over 140 in the 4½ years, if our proportion of carbonic oxide were the same as at San Francisco. But corrected by 1·86, which is the cube of the "relative increase," it would be 75·3 for our 50 per cent. mixture, *and yet there have been no cases of gas poisoning in our district*. And I must point out that the proportion of 0 to 3 (if Dr. Haldane can substantiate that figure), or to 31·7 or 75·3, is just the same. I do not think it can be denied that anyone glancing down Table I. would conclude from the San Francisco item that 940 deaths per year from gas poisoning would probably be produced in London if 70 per cent. of its supply were carburetted water gas; and I say that Tottenham experience has proved this to be absolutely and utterly false.

Now let us examine it another way. Dr. Haldane says in his letter that our proper proportion of deaths is 3 for 2000 million cubic feet of 50 per cent. mixture. This would be 48 deaths for 32,000 millions; and when corrected by the "cube" rule this would be 89 deaths for a 70 per cent. mixture. Why then does 940 appear in the table? Again, I say our Tottenham experience indicates that none even of the 48 would have occurred with a 50 per cent. mixture; and it is therefore fair to suppose that the 89 is a long way from the truth, and that our zero mark is more reliable.

Turning again to the table, Baltimore gas (100 per cent. water gas), although more than twice as risky as San Francisco gas judged by the "cube" rule (2·09 is the exact cube of the "relative increase"), is shown by the table to be far safer, as only 120 deaths are put down for 6 millions population, instead of 1965 which it would be if the San Francisco item were a reliable standard. How can Dr. Haldane substantiate his "cube" rule in face of this?

Now let me judge it another way. Scotch gas is known to contain twice the proportion of carbonic oxide that London gas contains. The cube of 2 is 8; but can Dr. Haldane show by statistics that Scotch gas has proved itself eight times as fatal as English gas? If he cannot, I submit that his "cube" rule falls entirely; that I was justified in ignoring it; and that 59 by consumption or 140 by population are the correct figures to take from his San Francisco estimate, to place in opposition to our 0 of actual experience.

I still venture to consider that Tottenham is a fairer criterion of what carburetted water gas would be in London than any American town. Table I. is so contradictory that I do not think San Francisco, or any of the others, reliable in any degree.

It is fair to assume that the recommendations, and more particularly that portion which relates to the restriction of carbonic oxide in delivered gas, is based on Table I. and Dr. Haldane's rule; and if I have estimated them at their real value, what is to be said of the report? Let us hope, in any case, that right will prevail, and the "greatest good" be found at the finish.

It is only a very minor matter; but I should like Dr. Haldane to use the words "carburetted water gas by itself," or "simply," or "*per se*," instead of saying "the gas distributed by the Tottenham Company is not the pure carburetted water gas used in Boston," which is apt to convey to some minds the misapprehension that our gas is not pure.

In conclusion, I must thank Dr. Haldane for his very polite letter, and express the hope that this correspondence may aid to place the matter on its proper basis.

Tottenham, March 11, 1899. A. E. Broadberry.

Sulphate Working at Widnes.

Sir,—Mr. Carr's reply to the criticisms passed upon his statement of the result of sulphate making at Widnes, appear to me to be inconclusive and unconvincing.

As to my idea of a properly constructed sulphate plant, it is certainly not one in which it is possible to use about 6 cwt. more acid in the production of a ton of salt than is necessary for the neutralization of the ammonia which enters into its composition—which I gather from Mr. Carr's letter was the apparent condition of affairs at Widnes previous to the introduction of his superheater. It is difficult to believe that so much acid could be lost in this way; and there surely must be an error somewhere. Will Mr. Carr kindly say what is the specific gravity of the acid he now uses, and if it is the same as formerly employed? It seems to me quite impossible to produce a ton of sulphate with only 17½ cwt. of chamber acid. The theoretical amount of chamber acid of 120° strength required for the neutralization of 1 gallon of 8-oz. liquor, is 0·7144 lb. This gives 21¼ cwt. as the amount required for the production of a ton of salt, using 3300 gallons of 8-oz. liquor.

In practice, we use about 22 cwt. per ton of salt; and I have been content to work at this figure. But it will never do to rest satisfied with this if the introduction of a different form of superheater will reduce the amount to 17½ cwt.; and for this reason I am anxious for some further information.

East Greenwich, March 11, 1899. Joseph Tysoe.

Sir,—I am sorry to see from Mr. Isaac Carr's letter to the "Journal" this week, that he considers the concluding remark of my letter of the previous week an aspersion upon him. It was certainly not intended as such; and I readily withdraw, and will put it in a way to which he can hardly take exception.

What I wished to point was the fact that if Mr. Carr (however unintentionally) estimated the quantity of fuel and acid used before the introduction of his heater at too high a figure, then his estimated saving was necessarily too high, and did not represent the money value which he put upon it.

This Mr. Carr can hardly fail to admit; and I leave it with your readers, who are sulphate makers, to decide from their own experience whether he did err in the estimate upon which he based his saving.

Sheffield, March 10, 1899. Fletcher W. Stevenson.

Emptying a Gasholder Tank.

Sir,—It is required to empty a gasholder tank, containing 60,000 gallons of water, which has been in use for about 45 years, without fouling neighbouring wells, water courses, or sewage; and I should be glad if any reader of the "Journal" who has successfully surmounted a similar difficulty will be good enough to give me a few practical hints as to the best method of procedure.

March 1, 1899. M. J. P.

New Reservoir for Colne.—The Colne Corporation have decided upon the construction of a new compensation reservoir in Wycollar Valley, three miles from Colne, which will involve an outlay of not less than £100,000. The Engineers are Messrs. Hill and Sons, of Manchester.

The Purchase of the West Melton Water-Works.—The final meeting of the West Melton Water Company was held last Tuesday. The undertaking was acquired by compulsory purchase last October by the Wath District Council; and the amount paid for the concern was £13,250. Accounts were submitted to the shareholders in accordance with previous resolutions; and it was stated that the whole of the share capital had been returned to the holders with a bonus of 15s., or 35s. for every £1 share. In addition, the ordinary shareholders receive 10 per cent. up to September last; and the preference shareholders 5 per cent. to date.

West Bridgford Water Supply.—An application to the Local Government Board by the West Bridgford District Council for sanction to borrow £20,000 for purposes of water supply, has been the subject of an inquiry by Colonel W. L. Coke. The project was opposed by the Nottingham Corporation and the Trent Navigation Company. The parish has been supplied by the former body under an agreement; and they objected to power being given to the Council to come into their area. It was urged on behalf of the Corporation that it would be absolutely contrary to the practice of the Local Government Board, and the provisions of the Public Health Act.

Messrs. Richmond and Co., Limited.—The annual general meeting of this Company was held at Warrington on Tuesday, the 28th ult.—Mr. E. W. T. Richmond in the chair. The accounts presented (which were for a period of fifteen months) showed a balance standing to the credit of the profit and loss account on Dec. 31, 1898 (after deducting the debenture interest, but not charging the interim dividend on the ordinary shares, nor the interest on the preference shares) of £6941, which with £529 brought forward gave a total of £7470. The dividend on the preference share capital for the twelve months absorbed £1155; a dividend at the rate of 10 per cent. per annum, free of income-tax, on the ordinary share capital, took £2258; Managing-Directors and Managers' commission on the year's profit, £1130; and shares and cash allocated to the employees' profit-sharing fund, £1000. In moving the adoption of the report and accounts, the Chairman said the growth of the business during the past twelve months had been the largest and fastest they had ever had—being at the rate of 42·37 per cent. on the business for 1897. The previous years each had shown very large increases—viz., 37 per cent. in 1897, and 32 per cent. in 1896. Last June, they entered into a contract with the Plymouth Gas Company for fifteen years, during which time they would practically have the sole supply of all the stoves required in Plymouth; and they had been fortunate enough to be favoured only in the previous week by the Dublin Gas Company with a contract on similar lines. Considerable satisfaction was expressed by the shareholders at the excellent prospects of increased business during the current year; and the report and accounts were unanimously passed. At the close of the ordinary meeting, a special meeting was held at which it was unanimously resolved to increase the capital of the Company by the creation of 10,000 new ordinary shares and a similar number of preference shares, all of £1 each. To satisfy the proprietors that this additional capital was really necessary, Mr. Richmond stated that in the previous week they had received the largest number of orders they had had in one week since the formation of the Company, notwithstanding that the season had not commenced.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills committed: Herne Bay Water Bill, Walton-on-Thames and Weybridge Gas Bill.

The Bristol Gas Bill, the Glastonbury Water Bill, the Lea Bridge District Gas Bill, the Nene Valley Water Bill, the St. Neots Water Bill, and the Yeadon and Guiseley Gas Bill have been referred to a Select Committee, consisting of Lord Pirbright (Chairman), the Earl of Stamford, Lord Sinclair, Lord Wimborne, and Lord Newton; to meet on Tuesday, March 14.

The St. Albans Gas Bill has been referred to a Select Committee, consisting of Lord Poltimore (Chairman), the Earl of Dartrey, Lord Saltoun, Lord Forester, and Lord Raglan; to meet on Tuesday, March 14.

The Airdrie and Coatbridge Water Bill, the Dumbarton Burgh Bill, the Perth Water, Police, and Gas Bill, and the Wishaw Water Bill have been referred to a Select Committee, consisting of the Earl of Derby (Chairman), the Earl of Malmesbury, Viscount Falkland, Lord Northbourne, and Lord Muncaster; to meet on Wednesday, March 15.

Petitions have been presented against the following Bills: Newhaven and Seaford Water Board Bill, St. Neots Water Bill, South Hants Water Bill, Stretford Gas Bill, Totland Water Bill.

Opposition to the Lanarkshire (Middle Ward District) Water Bill and the Rushden and Higham Ferrers District Gas Bill has been withdrawn.

HOUSE OF COMMONS.

Tuesday, March 7.

THE GASLIGHT AND COKE COMPANY BILL.

On the order for the second reading of this Bill,

Mr. Pickersgill moved, as an amendment, that the Bill be read a second time that day six months. He said the Bill was promoted by a Company of whom the House had heard a good deal in recent years. It was a Company with an enormous amount of capital—nearly £12,000,000 sterling—and who supplied a very large area north of the Thames. Throughout this vast area, the most profound dissatisfaction existed among the consumers with the results of the management of the Company; and this dissatisfaction was made all the more keen and clamorous by the fact that the consumer north of the Thames had to pay 3s. per 1000 cubic feet for his gas, whereas the consumer on the south side obtained his for 2s. 3d. per 1000 cubic feet. Moreover, the announcement was recently made that the latter rate was to be further reduced by 1d.; so that the consumer on the south side of the Thames would in the immediate future be paying 2s. 2d. per 1000 cubic feet for his gas. The Gaslight and Coke Company kept coming to Parliament for new powers. Last year they obtained from Parliament an Act enabling them to split their stock; and this year they had a Bill of another kind. What the gas consumers of the north of London said was that before these new powers were granted, some conditions ought to be imposed on the Company in the interest of the consumers. The promoters of the Bill had issued a statement in which they said that it was a most ordinary type of Private Bill. This was a description to which he could not give his assent. Part of the Bill, and a very important part, seemed to him to be of an exceedingly unusual, exceptional, and extraordinary character. It appeared that lands had from time to time been acquired by the Company without parliamentary powers; and these lands were conveyed to the Governor of the Company and another person, and held by them as trustees of the Company. The Company now came to Parliament and asked them to legalize their position with regard to these lands. He thought this was a demand to which they should be slow to respond; and certainly there was nothing in the relations of the Company towards the public which ought to induce Parliament to be specially indulgent towards the Company. He thought the House should leave the Company to settle their position in the best way they could, and should not now condone their illegality. Then the remainder of the Bill dealt with the proposed increase of stock. The House might possibly remember that over-capitalization had caused the extreme charges which were made by the Company; and yet, notwithstanding this, the Bill actually proposed an increase in the capital of the Company of no less a sum than £3,500,000 sterling. The promoters urged in their statement that debenture stock bore a lower rate of interest than did ordinary capital. This, of course, was true; and if the new debenture stock were to take the place of ordinary capital, the statement would be not only true but relevant. But this debenture stock was to be created, not in substitution for, but in addition to, the already existing capital; and therefore he put it to the House that the interest to be provided upon so large an amount of new capital must tend to an increase rather than a reduction in the price of gas. There was one other point in the statement to which he must refer. There was an unctuous allusion to the poorer class of consumers, who made use of the penny-in-the-slot system. He was surprised that this reference should have been made, because he thought that, of all classes of their consumers, The Gaslight and Coke Company used these poorer ones, who made use of the penny-in-the-slot system, most harshly. The Company charged a 1d. for every 22 cubic feet of gas consumed; whereas the South Metropolitan Gas Company gave 29 cubic feet for 1d. The Bill was opposed by the Corporation of the City of London. The fact that he was co-operating with the Corporation in this matter, with whom he seldom had the honour to act, was in itself a sort of *primâ facie* argument in favour of the reasonableness of his opposition to the Bill.

Mr. Boulnois said the honourable member had described this as not an ordinary Bill. He himself, on the contrary, maintained that it was quite the ordinary type of Bill usually sent to a Select Committee. It was a Bill promoted by an existing Company in order to raise further capital, which they could not do without the sanction of Parliament. There was no question of principle whatever in the Bill. They proposed to raise the additional capital so that they might fulfil the statutory obligations which had been imposed on them. It was quite impossible for the House to say whether this further capital was needed, or whether it was too large for the Company's requirements. That was a matter which a Select Committee would in the ordinary way inquire into. Then as to the question of price, this was a matter also with which he maintained the House could not deal. If the Company charged too much for gas, the Committee would deal with that. There might be twenty reasons why The Gaslight and Coke Company charged more than the South Metropolitan Gas Company on the south side of the Thames; but they could not now go into them. He had no doubt that if an inquiry were made, a good defence could be given by the Company for their higher charge on the north side. The member for East Islington (Mr. Cohen) had put down a motion that he would ask the House to appoint a Select Committee to inquire into the powers of charge conferred by Parliament on the Metropolitan Gas Companies, and report thereon; and this motion had practically been blocked by Mr. Pickersgill. The honourable member would not allow them to have the Committee; and now he would not allow the Company to have their Bill. Thus he had established a dead-lock, from which, however, it was to be hoped the House would now free them by adopting the usual course, and sending the Bill to a Committee upstairs, in order that it might be thrashed out. It had been said that the Company kept coming to Parliament for further powers; but this was not strictly correct. It was true the Company came last year to Parliament to get permission to consolidate their stock; but practically they had not been to Parliament for 23 years for additional capital. When they considered the enormous growth of London, and the extension of the districts which the Company had to supply, it was not unreasonable that after 23 years they should find themselves a little crippled, and unable without further capital to extend their works and mains in order to supply the increasing population. The honourable member opposite had alluded to the unctuous clause, as he called it, in which the promoters took credit for supplying the rapidly increasing demands of the working population with gas on the penny-in-the-slot system. He thought it was very creditable to the Company to have established a system by which the working classes could get a pennyworth of gas when they were not able to buy six pennyworth.

Mr. Pickersgill said he did not object at all to the establishment of the system; what he objected to was the exorbitant charge.

Mr. Boulnois said there might be many reasons why the Company were obliged to charge rather more than another Company. The same thing applied to Electric Lighting Companies in London; and it was quite understandable that there might be reasons, which the Company could give to a Committee upstairs, why this difference should be made. Then the honourable member said that he was allied with the Corporation in his opposition to the Bill. He should like to know whether the Corporation had given him a brief to move the rejection of the Bill on the second reading.

Mr. Pickersgill said he had had a valuable communication from an officer of the Corporation.

Mr. Boulnois replied that he had no doubt about that; but he should be very much surprised if the Corporation were attempting to throw out a Bill on the second reading which they knew perfectly well ought to be sent to a Committee upstairs, where they would have an opportunity of appearing to urge their grievances against the Company and of establishing their opposition. He was rather surprised at the unusual course of asking the House to reject the Bill at this stage. The Committee could make all necessary inquiries. They could examine witnesses brought before them, and hear all the objections which could be urged against the Bill, which it was impossible for the House to hear. The House was not a competent tribunal to deal with the details of a Bill of this kind; and he therefore hoped they would send the Bill before a Committee.

Mr. Cohen said he had had since the commencement of the session a motion on the paper which had for its object, and which in his opinion would have for its result, the very thing the honourable member opposite professed to desire. It was, however, owing to the opposition of the honourable member that the inquiry which he believed would accomplish what they desired—a uniformity of charge on the north side of the Thames—could not be obtained. The present Bill was designed to facilitate certainly the more efficient provision of gas north of the Thames; and he did not see how opposing it would in any way cheapen the price of gas, any more than would the blocking of the motion for an inquiry. The effect of the amendment must be to prevent an inquiry. He did not come before the House as a supporter of the interests of The Gaslight and Coke Company. He believed that they did charge unjustly, considering the price of gas north and south of the Thames. Because the Company did this, he wanted to apply a remedy which he believed would redress their grievances; and he did not wish to stop an effort for the improvement of the plant, which, if it did anything at all, would facilitate the cheap and expeditious supply of gas throughout their district. He was aware that the London County Council were also opposing the Bill. They did so avowedly for a reason with which he had no sympathy—they were of opinion that it would enhance the value of the undertaking. He did not know whether it would do so or not; but if it did, it would only do so legitimately, because it was going to add he did not know how many hundred miles of piping to the various other plant. This was an argument which did not appeal to him, because he at any rate did not desire The Gaslight and Coke Company to be the property of the London County Council. He thought the Corporation of the City of London were very suspicious. He did not know positively that the Corporation were in sympathy with his motion for a Committee, which the honourable member had blocked. He did not know either whether they were opposed to this measure, which he at any rate hoped would be unanimously read a second time.

Mr. Bartley said his constituents took a great interest in this matter, and were extremely anxious to have the inquiry which his honourable friend had proposed. He thought it should be known in London that the reason why this inquiry could not be held was that the honourable member for Bethnal Green had put a stop to it.

The amendment was negatived without a division; and the Bill was then read a second time.

Mr. Pickersgill rose to move—"That the Bill be committed to a Select Committee of fifteen members, of whom seven shall be nominated by the Committee of Selection. That it be an instruction to the Committee to inquire into the powers of charge conferred by Parliament on the Metropolitan Gas Companies, and to report as to the method in which these powers have been exercised, having regard to the differences of price charged by the various Companies; and also whether the provisions of

the Acts fixing the price of gas supplied and the rate of dividend should be reconsidered."

The SPEAKER said the honourable member was out of order in proposing to refer an instruction to the Committee on this particular Private Bill to inquire into the powers of a number of other Gas Companies.

Mr. PICKERSGILL said he would in that case move the first part only of his motion. His object in wishing to refer the Bill to a Select Committee of fifteen members was that the House might keep better control over the Bill until a more effectual inquiry had been made into the results of the management of The Gaslight and Coke Company, and into the statutory conditions at present existing, than would be possible if the Bill were referred to an ordinary Committee.

Mr. S. SMITH formally seconded the motion.

Mr. J. W. LOWTHER hoped the honourable member would not press his motion. He thought there was really no object in sending the Bill to a Select Committee of fifteen members, because they would not have the power that the honourable member intended when he put his instruction on the paper.

Mr. PICKERSGILL said that after the ruling which had been given, which had prevented him from moving the instruction to the Committee, he begged to withdraw his motion.

The motion was then, by leave, withdrawn; and the Bill was read a second time.

Thursday, March 9.

METROPOLITAN WATER COMPANIES BILL.

On the motion for the second reading of this Bill,

Mr. STUART pointed out that the Bill now brought forward was in substitution for the one first distributed.

Mr. CHAPLIN (interrupting) said the substitution had occurred in connection with the omission of a proviso to clause 2. The Bill he authorized to go to the printer contained the proviso, and its omission was entirely due to the printer's mistake. The proviso embodied a recommendation of the Royal Commission, and had been in every draft of the Bill.

Mr. STUART said he, of course, accepted the explanation, but it did not diminish the effect of the paragraph. Clause 2 was a very important one, and when he saw it in an early copy of the Bill without the present addition, he came to the conclusion that there would be no need to discuss the measure, because the sinking fund provision was contained within it. His discomfiture might be imagined when he subsequently found that a clause had been introduced excluding the operation of the sinking fund. It would be quite impossible to discuss the question of the sinking fund in a full Committee of the House. It could only be considered by a Select Committee; and he hoped that the Committee would have power to call for persons and documents.

Mr. CHAPLIN intimated that it would.

Mr. STUART said he was glad to hear it. Having criticized the phraseology of the Bill, the honourable member went on to say that one of its results, in respect of the next water famine, would be to attach responsibility to the Local Government Board and not to the Water Companies. He thought the right honourable gentleman was adopting a responsibility for which his Department would some day be sorry. If the water supply of London were in one hand, all that was proposed by the Bill could be done with perfect ease, without the necessity for an Act of Parliament. There were really only two methods of dealing with the water supply of London. One was amalgamation, the other purchase. So far as the Bill went, it was a step in the first-named direction; but it was wrong in its conception and faulty in several of its most important details.

Sir F. DIXON-HARTLAND said the great principle of the Bill was not to increase the powers of the Water Companies, but only to amalgamate them. It was their duty to see that there was no water famine in the east of London in the future; and therefore he hoped the Bill would soon become law.

Mr. CHAPLIN pointed out that the Bill in no way affected the larger questions of the future Water Authority for London, the purchase value of the undertakings, or the interests of ratepayers and consumers. The question of the Water Authority was left absolutely untouched by the Bill. On that question he preserved an absolutely open mind, until the report of the Royal Commission was furnished, when it would be the duty of the Government to come to a decision upon it. With regard to the second question—the purchase value—there was a special clause in the Bill which provided that it should not in any way authorize the Companies to bring into account, or make any claim in respect to, any advantages conferred by, or resulting from, the passing of the measure. Upon the third point, the effect of the Bill was quite certain to be an improved supply of water; and it was directly to the benefit of the ratepayers and consumers of East London in particular that it should be passed. The details could be threshed out before the Committee; and in the interests of the hundreds of thousands of the poorer classes of East London, he appealed to the House to allow the Bill to be read a second time, so that it might proceed on its course, and become law at the earliest moment.

Mr. BUXTON intimated that he certainly did not intend to oppose the Bill; but he should like an assurance from the right honourable gentleman that, as far as this particular measure was concerned, he looked upon it as temporary, and that it would not be allowed to prejudice the question of the best means of intercommunication between all the Companies.

The Bill was read a second time, and referred to a Hybrid Committee.

METROPOLITAN GAS COMPANIES' CHARGES.

Just after mid-night, the order was read for resuming the debate (adjourned from the 20th ult.) on the following motion by Mr. Cohen: "That a Select Committee be appointed to inquire into the powers of charge conferred by Parliament on the Metropolitan Gas Companies, and to report as to the method in which those powers have been exercised, having regard to the differences of price charged by the various Companies," to which Mr. Pickersgill had given notice of an amendment to add at the end, "and also whether the provisions of the Acts fixing the price of gas supplied and the rate of dividend should be reconsidered." On the resumption of the debate, however, the honourable member said he would not move the amendment; whereupon the motion was agreed to, and the Committee appointed.

Friday, March 10.

LOCAL AUTHORITIES AND ELECTRIC LIGHTING.

Mr. BAYLEY asked the President of the Board of Trade if he could state the number of Local Authorities who have obtained and are holding Provisional Orders for electric lighting without doing anything to carry their powers into practical effect.

Mr. RITCHIE: There are 30 Local Authorities who have obtained Provisional Orders for electric lighting who have taken no steps to give effect to their Orders within the time prescribed for the execution of compulsory works. Besides these there are 63 others who obtained Orders in 1897 and 1898, and have apparently done no work; but the time prescribed by their Orders has not yet expired. I may mention that the Board of Trade have lately been calling the attention of Local Authorities who are not exercising their powers to the matter, and have intimated that the Board propose to consider the question of revoking the Orders. In nearly all these cases the Local Authorities have replied that they are taking steps to carry their Orders into execution.

Mr. GIBSON BOWLES asked if the right honourable gentleman could say how many Authorities had obtained Orders and were exercising their powers.

Mr. RITCHIE could not answer the question.

THE MANUFACTURE AND USE OF WATER GAS.

Mr. ASHCROFT asked the Secretary of State for the Home Department whether his attention had been called to the report of the Departmental Committee appointed to inquire into the manufacture and use of water gas and other gases containing a large proportion of carbonic oxide, and to the dangers that were likely to arise to the public safety unless restrictions were placed upon the manufacture, as recommended by the Committee; and whether it was the intention of the Government to introduce a Bill dealing with the matter.

Mr. COLLINGS, who replied to the question, said the report of the Committee was made to the Secretary of State, and was by him laid upon the table of the House. He was now consulting his colleagues, the Presidents of the Board of Trade and of the Local Government Board, who were represented on the Committee, as to the recommendations; but it had not yet been decided what action should be taken.

The following further progress has been made with Bills:—

Bill presented and read the first time: Belfast Corporation Bill.

Bills read a second time and committed: Horsforth Water Bill, Stockport District Water Bill.

Bills reported: Crowborough District Water Bill, Fishguard Water and Gas Bill.

The Burley-in-Wharfedale Urban District Water Bill, the Goole Urban District Council Bill, the Horsforth Urban District Council Water Bill, the Horsforth Water Bill, the Menstone Water Bill, the Otley Urban District Council Water Bill, the New Mills Urban District Council Water Bill, the Stockport Corporation Water Bill, the Stockport District Water Bill, the Walker and Wallsend Union Gas (Electric Lighting) Bill, and the Wetherby District Water Bill—the Bills comprised in Group A—have been referred to a Select Committee, consisting of Mr. Baldwin (Chairman), Mr. Strachey, Mr. Hazell, and Mr. Evelyn Cecil; to meet on Tuesday, March 14.

The Clay Cross Water Bill, the Godalming Corporation Water Bill, the Ilford Gas Bill, the Ilford Urban District Council Gas Bill, the Redditch Gas Bill, the Rhondda Urban District Council Bill, the West Gloucestershire Water Bill, and the Woking Water and Gas Bill—the Bills comprised in Group C—have been referred to a Select Committee, consisting of Mr. Schwann (Chairman), Colonel Long, Mr. Duckworth, Sir Cameron Gull, and Mr. Bonham-Carter (Referee); to meet on Tuesday, March 14.

The Gaslight and Coke Company Bill—one of those in Group E—has been referred to a Select Committee, consisting of Sir William Coddington (Chairman), Mr. Price, Mr. Cubitt, and Mr. Clough; to meet on Thursday, March 16.

The scheme of the County Council of London for the supply of water to the Metropolis from Wales came before the Standing Orders Committee of the House of Commons on Friday in the shape of the petition for the London Water (Welsh Reservoirs and Works) Bill. It will be remembered that allegations of non-compliance with the Standing Orders were made before one of the Examiners of Private Bills—Mr. Campion—who sat for eight days to investigate them. In the end, he submitted a detailed report to the Standing Orders Committee, in which he sustained many of the allegations. After deliberation in private, the Committee decided to dispense with the Standing Orders, and allow the Bill to proceed. This decision they duly reported to the House.

The Committee have also reported that in the cases of the Belfast Corporation Bill and the Skipton Gas Bill, the Standing Orders ought to be dispensed with.

The Lighting of the Houses of Parliament.—A correspondent of the "Westminster Gazette" says: "The recent admission that the lighting of the Houses of Parliament costs no less than £40 a night recalls to mind the fact that previous to 1834 (the year of the destructive fire) the House of Commons was lighted by candles, which were affixed to massive chandeliers. The Lyceum Theatre was the first public building in London to be lighted with gas—this being in the year 1803; but it was not until 1839 that experiments were made in lighting the House of Commons with a Bude light, followed in 1852 by the introduction of Dr. Reid's system."

Cranbrook District Water Company.—By an announcement which appears in another part of the "JOURNAL," our readers will see that the Directors of the above-named Company are inviting tenders for 10,011 ordinary shares of £1 each, ranking for dividend up to 7 per cent. per annum, and 9382 preference shares, carrying a dividend of 5 per cent. The amount offered (£19,393) is the balance of the £36,000 authorized by the Company's Act of last session; and it is required to complete the new works, which are now being actively proceeded with. Under their Act of 1895, the Company were authorized to supply Cranbrook, Goudhurst, and Hawkhurst; but last session their limits were extended so as to take in several other places, including Tenterden. Cranbrook and Hawkhurst are being supplied, and the Goudhurst services are in progress.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Tuesday, March 7.

(*Before Mr. Justice* BYRNE.)

The Incandescent Gaslight Company, Limited, v. The Daylight Incandescent Mantle Company, Limited.

This was a case brought to obtain an injunction against the infringement of the Welsbach patent.

Mr. FLETCHER MOULTON, Q.C., Mr. T. TERRELL, Q.C., Mr. ROGER WALLACE, Q.C., and Mr. WALTER appeared for the plaintiffs; Mr. BOUSFIELD, Q.C., Mr. GRAHAM, and Mr. COLEFAX for the defendants.

Mr. MOULTON, in opening the case, briefly described the nature of the invention as consisting in the obtaining of greater light by the heating of a solid body to incandescence than could be secured directly from the combustion of the gas itself. The plaintiffs were the proprietors of all the Welsbach patents, including the fundamental one of 1885, which had been the subject of several actions, and had come out unscathed from them all. The defendants were one of the many Companies who had tried to avail themselves of Dr. Welsbach's discoveries—making some slight difference in their mode of construction, which they hoped would save them from being held to be infringers. There was no contest about the nature of the article sold by the defendants or the fact of its sale; and defendants did not directly challenge the validity of the plaintiffs' patent. But they denied infringement, and put in a plea something in the form of a dilemma—viz., that if the specifications were so construed as to make the defendants infringers, then it was invalid, for two reasons. The first was that it did not sufficiently describe the manner in which the invention was to be carried out; and the second, that it would include a claim to combinations which were useless. It seemed to him that neither of these propositions could be relied on in the way the defendants suggested. They were simply questions of the construction of the specification; and there was no suggestion that the invention was not new. As he had already mentioned, this was not the first litigation regarding the patent.

Justice BYRNE said he believed he had been himself concerned in one former case; but all he recollected about it was that it had something to do with yttrium.

Mr. GRAHAM replied that he had no objection to his Lordship hearing the case.

Mr. MOULTON accordingly proceeded with his narrative. The first action brought by the predecessors of the present plaintiffs was against the Deimel Company, who proposed to work a patent belonging to a person named Hirschfeld. That was obviously a bogus patent; and no doubt Hirschfeld deceived the Company by showing them mantles not made according to his patent at all, but according to that of the plaintiffs. When the case came before Mr. Justice Romer, it was evident that the defendants were not intentional wrongdoers, and an arrangement was come to by which judgment was given for the plaintiffs without costs; but Mr. Justice Romer certified the validity of the patent. Then came the case in which the validity of the patent was strongly contested; the trial occupying ten days before Mr. Justice Wills, when the validity of the patent was established, and also the infringement. This was the De Mare case, in which the defendants had a patent for a sort of fringe which took the place of the mantle. The case went to the Court of Appeal, when the plaintiffs' specification was very carefully considered; and he should have to call attention to the judgments of their Lordships in this action, who unanimously upheld the decision of Mr. Justice Wills. The Sunlight case followed, in which the defendants were held not to be infringers; and this judgment was not appealed against. Since then there had been only one contested case—the Meteor—in which the defendant ultimately did not appear, and judgment was given against him. The principal case was the De Mare; and in his opinion the defence in the present action was mainly based on a misapprehension of the Sunlight case. He should submit that, on the other hand, it came clearly within the De Mare case as dealt with in the Court of Appeal; and it was possible that if these judgments had been given before the Sunlight case was tried, Mr. Justice Wills might have come to a different decision even in that case. The Court of Appeal went very fully into the scope and nature of the invention, and then considered whether the "pith and marrow" of it had been taken by the defendants; and though in one sense there was no doubt the infringement was outside the language of the claim, construed narrowly, yet their Lordships, following the decision of the House of Lords in *Clarke v. Adey*, held that the substance of it had been taken. Counsel then briefly described the invention of Dr. Welsbach, which he said consisted mainly of two parts. The first was a totally new structure for his incandescent body—viz., the skeleton fabric, instead of a solid body or basket such as had been used before—and the second, the use of rare earths as the material to be rendered incandescent. He then read the specification of the 1885 patent, and gave further details of the De Mare and Sunlight cases. In the latter, the defendants escaped because, though they used the same process for making the mantle, and employed zirconium and alumina, they obtained their illuminating power by spraying the mantle with chromium, which was not mentioned by Welsbach, and was not within the class of rare earths. The case was undoubtedly on the border line; but as Dr. Welsbach had not claimed separately for his mantle, and it was not commercially very important, the judgment was not appealed against. Since then, infringers had been seeing how much nearer they could get; and the present defendants made a mantle exactly similar to that of the plaintiffs so far as the structure was concerned, and dipped it in a solution of zirconia, lime, magnesia, and iron. But substantially it was a zirconia mantle, with a little lime, which he did not think was of any importance, and soon disappeared. Zirconia, however, was not good enough, as it gave very little light; and so, after burning off, a little cerium was added, which made it highly luminous. He was quite ready to admit that at the date of the patent Dr. Welsbach did not know so much about cerium as was known now; but he did refer to cerium in his specification, and gave a warning that there must not be much—the fact being that though a small percentage of cerium was highly advantageous, any considerable quantity spoiled the mantle entirely. The defendants' mantle was practically zirconia, with the addition of ½ per cent. of cerium, which was dissolved in alcohol, and the mantle was dipped in it. He should submit that it was totally different from the Sunlight case, and was even stronger than the De Mare, because in the latter a considerable percentage of another body—erbium—not mentioned by Welsbach, was used. These defendants used the very substances mentioned in the specification.

Justice BYRNE asked if Mr. Moulton contended that no one could take any of the rare earths included in the terms ytterite earths and cerite earths, and use them for incandescent mantles.

Mr. MOULTON said he should go as far as that; and he thought he should be supported by the judgments of the Court of Appeal in the De Mare case, which he would next proceed to read.

Wednesday, March 8.

Mr. MOULTON commenced this morning by reading long extracts from the judgment of Mr. Justice Wills in the De Mare case, including his general description of the nature of the invention and the mode of carrying it out; and also the way in which he disposed of the objections to the patent then raised, but which had not been insisted upon since. He dwelt partly on the portion in which the learned Judge dealt with the question of infringement. He then proceeded to read the judgment in the Sunlight case, which Mr. Justice Wills decided mainly on the ground that the defendants did not use any of the rare earths for the purpose of producing luminosity. He should submit that if one of the rare earths had been used instead of chromium, the Sunlight mantle would have been held to be an infringement. He then passed on to the judgments of the Court of Appeal in the De Mare case; the reading of which, with occasional comments, occupied a considerable time. He next proceeded to state what the defendants in the present case were doing. They used practically zirconia, with the addition of ½ per cent. of cerium. It was very extraordinary that Welsbach in 1885 should have given a special warning against cerium in anything but a small proportion. He must have found that cerium would do, but not in large quantities.

Justice BYRNE pointed out that the apparent meaning of Welsbach was that a little cerium would not hurt—not that it would do any good.

Mr. MOULTON said that was no doubt the case. It had been found out since that, under certain conditions, a slight addition of cerium was highly beneficial. In fact, Welsbach himself had taught the world which was the best proportion in which to use it. It appeared to him that this was a stronger case than the De Mare, because, though lanthanum was omitted, the illuminating power was obtained entirely from a rare earth. It could make no difference that the cerium was added by a second operation. The defendants said if the plaintiffs' patent included this, it was bad, because it did not contain sufficient directions; but any experiments made to obtain a particular blend would all be made under the patent. Sufficient information was given to produce a good result; and any further invention which led to an improvement would still be an infringement. If it were otherwise, any improvement would vitiate the original invention. The next objection was that if the specification were read in such a wide manner, it would include many things which were useless. But no one need employ anything which was useless. The burden was not cast on a patentee of exactly formulating all the exact permutations which would be useful and which would not.

Professor *James Dewar* was the first witness called for the plaintiffs. He said he had had Welsbach's invention under his notice for many years. He first explained the method of manufacture—the making of the solution, the dipping of the mantles, and the ignition, leaving the skeleton formed of the blends of oxides of the rare metals. As described in the patent, each user was supposed to complete the process himself. Now the mantles were burned off at the factory, and then dipped in collodion, so as to render them capable of transit. The variation in the blends depended on the nitrates employed. The mantles were all made in the same way, whether thorium or zirconia were used. The knowledge of the properties of the rare earths was much larger than in 1885, mainly owing to the reaction of commercial processes on Welsbach's inventions. A great variety of blends had been used. He had not analyzed defendants' mantle, but took Mr. Ballantine's figures—viz., zirconia 93·2, cerium oxide 0·49, oxide of calcium 5·71, magnesia 0·20, and oxide of iron 0·27. These added up to 99·87. The illumination was not due to the presence of lime, which he took to be simply an equivalent for the magnesia mentioned by Welsbach. Cerium was one of the rare earths. Didymium was hurtful. Cerium in small proportions added enormously to the power of light emission. In large quantities, it did not. In this mantle the cerium was most essential; without it the illumination would be very small. It was easy to make experiments with various blends of the nitrates. In his view, the illumination was obtained in the same way as Welsbach described. It made no difference whether the cerium was sprayed on or was added to the nitrate solution, or if the cerium was put on first. Nor did it make any difference whether it was used in an aqueous or alcoholic solution.

Cross-examined: He knew defendants mixed the cerium with the collodion into which the mantle was dipped. The lime was more volatile than the other constituents—something like magnesia, which it had been suggested might be used as a substitute for zirconia. As a matter of fact, the addition of magnesia or lime to zirconia made it more emissive. He quite agreed with Welsbach that the addition of magnesia to his blend rendered it less emissive. He started with a compound of lanthanum and zirconia. Then he said they might leave out part of the lanthanum, and add yttrium; and that instead of yttrium they might use ytterite earths, and instead of zirconia cerite earths. He also said that in place of a portion of the lanthanum, magnesia might be employed. Calcium would not be rapidly volatilized in conjunction with zirconia. The first stage in making defendants' mantle was the same as with the Sunlight. In both cases there was a skeleton of considerable coherence, but with hardly any illuminating power. The Sunlight mantle partly was a very strong one—stronger than the Daylight. In the Sunlight case, the coating was chromium; in this it was cerium. In neither instance did it make any difference in what order the substances were introduced. Spraying or dipping made no difference. The candle power of defendants' mantle before the treatment with cerium was about 2·4 per cubic foot per hour, according to his experiments. That was about the power of an ordinary coal-gas flame. When treated with cerium to the

amount 0·4 per cent. it gave 6-candle power. Mr. Bousfield said he was told it would give 10 candles; and witness replied that a slight addition of cerium—0·5 per cent. instead of 0·4 per cent.—might bring it up to that. If the same proportion of cerium were introduced into the solution in the first place, he could not agree that the result would be much inferior. In the figure he had already given the salts were all mixed together. In the second experiment, when the cerium was added afterwards by dipping, the illuminating power was 6·1 candles. A further experiment gave 5·1 candles; and in another he impregnated with cerium first, and then obtained 6·2 candles. In a further experiment, he dissolved all the salts in collodion. He had tried every possible permutation he could think of; and the results were substantially the same. When Welsbach suggested that the mantle might be dipped a second time into a concentrated solution, he did not think it necessarily meant that this should take place before burning off. Any chemist would know that the mantles could be redipped after burning off. At the time of the patent, the process of collodion dipping was not suggested; and a burnt-off mantle could not then practically be sent about. He remembered the discussion in the De Mare case as to the ytterite and cerite earths; and he thought the result was fairly summed up by Mr. Justice Wills in his judgment. The cerium group included cerium, didymium, and lanthanum. Zirconia was not included in the rare earths in the sense in which Welsbach used the term. The rare earths were practically confined to the cerium and yttrium groups. He did not agree that in 1885 Welsbach regarded cerium as a substance which was hurtful, but that a small proportion of it might be left in the cerite earth. He thought he looked upon a small portion as useful.

By Justice Byrne: It was quite possible to get rid entirely of cerium; but it was no doubt a troublesome process.

Cross-examination continued: To get substantially rid of cerium would require repeated processes. To get rid of all the cerium would be tedious; and Welsbach said a little would do no harm. It was more troublesome to get rid of the whole of the didymium. He was not aware of a patent by Welsbach in 1886 for a process of separating these three substances.

Mr. Terrell objected to the introduction of this patent; and a discussion ensued on this point. Ultimately,

Justice Byrne said he thought the document might be used in cross-examination on chemical facts, but not as to the construction of the patent in question.

Mr. Bousfield accordingly read a portion of the specification of 1886, which described a process for separating cerium from didymium and lanthanum. That was a known process. The properties of didymium and cerium were not the same in a mantle. He never found that a small quantity of didymium was beneficial.

A question was then put founded on Welsbach's patent of 1893, to show that didymium in small quantity was useful; but Mr. Terrell again objected, and another discussion ensued.

Witness said he was aware of the 1893 patent, which pointed out that a small addition of cerium enormously added to the luminosity of thorium. The present mantles made by plaintiffs consisted mainly of thorium, with a small percentage of cerium. He knew that it was stated that a small proportion of the constituents of didymium added to thorium was very useful; but he had not experimented with it himself. He thought probably that any oxide added to pure zirconia would make it more luminous. Mr. Bousfield then read abstracts from witness's evidence in the De Mare case, the purport of which was that, in his opinion, as much of the cerium as possible should be eliminated from the cerite earths, if they were used. Witness said that this was his view of the specification at the time; and he had nothing at all to alter. Substantially the cerium ought to be removed; but he should consider that it was substantially removed if 5 per cent. were left. There was nothing to suggest that it was any advantage to leave a little cerium in. Erbium was one of the ytterite earths, and was one of "the substances mentioned" in the speech. Didymium was also mentioned, but to be excluded, not used. He should not say the same of cerium. The first time it was known that a small percentage of cerium would give improved results in a mantle was in 1893—apart from what was contained in the 1885 specification. In 1886, Welsbach took out his patent for thoria; and this led to a great deal of investigation as to the various blends. Most of the prescriptions contained considerable proportions of the various substances—20, 30, or 40 per cent. Up to 1893, he did not remember any ingredient being used in such small proportion as 5 per cent. A mantle made of 50 per cent. zirconia and 50 per cent. lanthanum gave a candle power of 4·56. This was pure lanthanum oxide without any cerium. When some of the lanthanum was replaced by cerite earth containing 98 per cent. of lanthanum and 2 per cent. of cerium—or equal to 1 per cent. of cerium on the whole—the candle power was 8·8. He did not suggest that the specification gave any information as to these differences in illuminating power. The 1 per cent. of cerium was more important than the 49 per cent. of lanthanum.

Re-examined: Cerite earth without any didymium would be simply lanthanum, and would not therefore be a substitute for lanthanum. When the mantle was burned off, the fabric was in a state analogous to a biscuit, and would readily absorb any liquid into which it was dipped, or which was sprayed over it. It permeated the whole fabric, just as if it had been put in the original solution. He repeated his evidence-in-chief, that the mode of application of the solvent employed made no difference in the ultimate effect of the cerium. In the Sunlight case, chromium oxide was sprayed on a substantially alumina base, and combined with the alumina to form an incandescent material. In the present instance, the illuminating power was due to the zirconia stimulated by the oxide of cerium. The zirconia played the same part as in Welsbach's patent. In 1885, didymium was supposed to be one oxide. He was familiar with Welsbach's 1886 patent. Welsbach had discovered that didymium was actually composed of two substances, one of which was red and the other green. He had found that Welsbach was right in saying that didymium must be entirely eliminated from a mixture with zirconia. When lime was combined with zirconia, it did not volatilize so rapidly. Lime had some resemblance to lanthanum, but was more akin to magnesia.

Mr. *Horatio Ballantyne* produced the analysis of the defendants' mantles. He had manufactured mantles containing the same proportions, putting in the cerium at various stages of the manufacture, such as had already been spoken to by Professor Dewar. He had made several series of experiments, which all agreed in the results. He had examined the mantles microscopically, and could discover no distinction between mantles made all at one time, and those dipped in cerium afterwards.

Cross-examined: He did not agree that it was proved in the former case that the zirconia served to give strength to the mantle, and the other ingredients the luminosity. In the defendants' mantle he thought probably a zirconate of cerium was formed; but in the Sunlight mantle he did not think any such action took place. Just as good a mantle could he made with alumina alone; but the zirconia was a harmless diluent which helped to make a good mantle. A zirconia mantle alone gave a very poor light. With the addition of cerium it was much improved, but nothing like so good as that of the plaintiffs. It was the combination of the cerium and zirconium which produced the light; either body alone was practically useless. A large percentage of cerium was harmful. He did not consider it a fair interpretation of Welsbach's specification to say that it merely meant that a small proportion of cerium would not do any harm. It was contrary to his experience that any benefit was derived by dipping the mantle in the cerium after burning off; if anything, the result was better, which he attributed to inequality in the mantle.

Re-examined: There was no advantage in spraying; on the contrary, there were slight disadvantages. The Sunlight mantles were alleged to be manufactured under Delwik's patent.

Mr. Moulton said that was the plaintiffs' case, subject to his asking to call rebutting evidence if necessary.

Thursday, March 9.

Mr. Bousfield said he had not very much evidence to offer; and he thought it would be convenient to give it before addressing the Court.

Sir *William Crookes* was the first witness. He said he had specially investigated the rare earths, by means of the spectroscope and other methods. He was well acquainted with Welsbach's specification of 1885. He indicated certain materials and certain substitutions. If cerium were treated as a rare earth which might be substituted for either of the others named in similar proportions, it would give a very poor light of no practical utility. He was familiar with the phrase about cerite earth containing no didymium and but little cerium. The mineral cerite contained approximately 60 per cent. of cerium, and 3 per cent. each of lanthanum and didymium. He produced a specimen of cerite earth prepared by himself from the mineral cerite. It contained something like 90 per cent. of cerium. There was no natural cerite earth containing no didymium and but little cerium. He should, in following the specimen, take such a cerite earth as he had prepared, and then remove the didymium and cerium. The didymium would be more easily removed than the cerium. It was exceedingly difficult to remove the whole of the cerium. He did not find any indication that the retention of a small amount of cerium would be useful; but that would do it no harm. It was first disclosed that a small percentage of cerium was useful in 1893, in a patent of Welsbach's. He had experimented with didymium, in which he had taken the defendants' zirconia skeleton and dipped it in collodion containing didymium instead of cerium. The illuminating power of the skeleton before dipping was 11 candles for about 5 cubic feet of gas per hour. After dipping once, it gave 16·5-candle power; a second dipping increased the light to 20 candles; and a third, to 22 candles. In the 1893 patent it was stated that a thorium mantle was improved by the addition of a small percentage of didymium. His experiments went to show that didymium and cerium had similar effects when added in small quantities. It would be difficult to say what was the exact cause of this improvement; there were several theories, but none satisfied him entirely. They knew a little more about the effect of chromium in the Sunlight mantle; but it only put the difficulty one step farther back. There was a theory that these "exciters," as they were called, were bodies capable of two degrees of oxidation. Chromium was one of these bodies, and cerium another. He considered the action of the cerium in this case analogous to that of chromium in the Sunlight mantle. He had found by experiment that the light given was much better when the cerium was added in the collodion dipping than when it was put into the original solution. He made one or two hundred experiments, which practically were in accord, though there were occasional discrepancies.

Cross-examined: He considered that when Welsbach spoke of 50 per cent. zirconia and 50 per cent. lanthanum, or instead of that less lanthanum and cerite earth, he did not suggest that zirconia, lanthanum, and a little cerium should be used. The cerium was referred to as an impurity. He thought Welsbach was more frightened than he need have been of didymium. He was quite satisfied that the best results were attained by adding the cerium after the mantle was burnt off. There was some difficulty in ascertaining the exact proportion of the cerium taken up when the mantles were dipped in a collodion solution. When all the materials were added in one solution, one knew the exact proportion of each constituent.

Re-examined: The results he secured when the materials were put in one solution, were 43 candles. When the mantle was dipped afterwards, he obtained 53 candles.

Mr. Bousfield remarked that he had other scientific witnesses; but their evidence would be exactly the same, and he did not know that he need call them.

Justice Byrne said if it might be taken that the other witnesses would confirm Sir William Crookes, they need not be called.

Mr. Moulton accepted his friend's statement on that point.

Mr. Bousfield said in that case he would now address himself to his argument; and it was, after all, more a question of the construction of the specification than anything else. The patent was both for a process and for the materials used; and he should submit that unless both were taken, there was no infringement. The question really was, Did the defendants make a mantle as described of the substances mentioned, and treated as set forth? He did not think it was the most important part of the case; but he submitted that the coating with cerium by a second operation was not treating as set forth, and he was supported in that view by the judgment in the Sunlight case. The most important point, however, arose on the question of what were the substances mentioned. Welsbach described a mantle made substantially of zirconia and rare earths in about equal proportions. It could not be said that a mantle containing 95½ per cent. of zirconia and ½ per cent. of rare earth was included in that. Welsbach no doubt said the proportions might be varied within certain limits; and those limits were not given. But they could hardly

include such a variation as from half and half to 200 to 1. Nor did "the substances mentioned" include any one of the substances mentioned; it must be a compound. The patentee must define the limits of his invention. He should have said that the presence of lanthanum was essential, but for the decision of the Court of Appeal in the De Mare case. It was said that hard cases made bad law; and he thought the decision in question might be an instance of that. But, of course, he could not argue against that in this Court. The only principle on which he could assume the Court of Appeal acted in allowing the omission of lanthanum was that zirconia and any of the rare earths would come within the description. Then the question was, Did a mantle such as the defendants, come within this description? As Professor Dewar had said in the former case, cerium was simply mentioned by way of warning, together with didymium, though he thought the latter was the more harmful of the two. The question was whether the patentee was claiming the substance which he was warning them against. In support of his argument, he read several passages from the case of *Nobel's Explosive Company v. Anderson*, both in the original trial and in the Court of Appeal, and also some from the judgment of Mr. Justice Wills in the Sunlight case, which he submitted were strongly in favour of the present defendants—on the point of the material employed in the construction of the mantle, and on that of the subsequent coating with the illuminating material.

Mr. Graham followed; confining himself to the question of how the phrase "containing no didymium and but little cerium" should be construed. He pointed out that the word cerium occurred in a sentence referring to the substances which were to be excluded—not in one enumerating those which were to be used.

Mr. Moulton, in reply, suggested that his learned friends had not really touched the strength of the plaintiffs' case. The method used was the same as Welsbach's; and the materials employed were all mentioned in the specification. The only thing was that they had omitted the lanthanum; and this had been held in the former case not to be material, when the substance of the invention was taken.

Justice Byrne intimated that he would give judgment in a few days.

Disputed Right to Lay Water-Mains.

In the Chancery Division of the High Court of Justice a short time ago an action was concluded which had occupied Mr. Justice Byrne for several days. It had been brought by the East Surrey Water Company to obtain an injunction to restrain one Taylor from in any way interfering with or removing their line of water-mains, or any of the pipes laid by them, in pursuance of the provisions of their Act of Parliament, in the soil of a certain highway running across Colley Hill, in the parish of Reigate. The plaintiffs were incorporated by a Special Act in the year 1862, under the name of the Caterham Spring Water Company for the purpose of supplying the portion of the parish of Reigate known as the "Foreign." By a subsequent Act the name of the Company was altered to the East Surrey Water Company, and the limits of supply were extended. In 1896, the plaintiffs obtained a further Act, whereby their limits were extended to include Walton-on-the-Hill and Headley. In May, 1897, the plaintiffs being desirous of exercising and fulfilling their statutory powers and obligations to supply water to these places, proceeded to lay pipes across Colley Hill, of which Mr. Taylor claimed to be the owner. In November, 1897, the defendant, in assertion of his right, caused the pipes to be removed. The real dispute was whether or not the pipes had been laid under an old bridle-path. The plaintiffs contended they had, and in this case they had power to break up the soil of the highway; while the defendant maintained that the pipes were laid some distance from the path, and that therefore the plaintiffs were trespassers. A large number of witnesses were called. In the result, the matter was left with the view of the parties coming to terms; and last Wednesday Counsel informed his Lordship that an order had been agreed to which would put an end to the action. All parties being *sui juris*, the order could be drawn up in the terms arranged, and would be prefaced with the words "without prejudice"—neither side making any admission. An order had also been arranged in a second action—*The Sutton District Water Company v. Taylor*—which related to the same *locus in quo*.

Slot Gas-Meters and Cookers at Abergavenny.—The Abergavenny District Council have received a report from the Gas Committee to the effect that the cost of fitting workmen's houses for gas supply is estimated by their Engineer and Manager (Mr. S. Cross) at £6 6s., including £1 15s. for a small cooking-stove. On this sum the charges for interest, repairs, &c., would have to be met; and he puts these at 10 per cent., or 12s. 6d. per annum. He reckons the annual consumption of gas at 10,000 cubic feet; and at 18 cubic feet for 1d., a profit would be made at the present price. To carry out such a scheme, the Committee consider that a minimum number of 200 new consumers would be required, and additional capital would have to be raised. The Committee have agreed to recommend the Council to apply to the Local Government Board for authority to borrow a sum not exceeding £2000; and if this is agreed to, to issue an advertisement, inviting applications from persons who desire to avail themselves of a supply of gas in accordance with the proposed scheme.

The German Carbide Market.—German carbide consumers are still suffering from the scarcity of stocks which has made itself so markedly felt during the past two months; and large regular arrivals are not to be expected till May, when the Norwegian factories should have resumed their full output. One noteworthy fact of general interest made evident during the present position of the industry is that carbide loses its market immediately prices go beyond a certain point. Thus, according to the current increased demand, the market price should be at least £3 10s. to £4; whereas, as a matter of fact, it has stopped short at £3, and even at this figure a large number of acetylene works have been forced to suspend production. Consumers are showing great eagerness to cover their wants for the summer and next winter; and contracts have been placed to such an extent that the output of several manufactories has already been taken up in advance, at the increased price for large quantities of £1 13s. There has been a pretty free inquiry for export; but business has been quite checked by high prices, and dealers and consumers are forced to content themselves with covering only their immediate requirements from day to day.

MISCELLANEOUS NEWS.

THE HOME OFFICE WATER GAS INQUIRY.

Continuation of the Summary of the Evidence.

The epitome which we have already published of the evidence submitted to the Departmental Committee on Water Gas took us up to the end of the seventh day's sitting. The proceedings were resumed on the 9th of June, when Garston (which, as is well known, is supplied by the Liverpool Gas Company) obtained a hearing; the first witness being

Dr. J. A. Fisher, *Medical Officer of Health for Garston.*

He came to the point at once, and told the Committee that, during the previous two years, there had been fifteen cases of poisoning in Garston from pure carburetted water gas, and two of them were fatal. The statistics were obtained from the medical men who attended the sufferers. Of the thirteen who recovered, one was unconscious for 72 hours, one for 11 hours, and one for 7 hours. There was a case of chronic poisoning after inhalation of smaller doses at night, which had resulted in impaired health. The two fatal cases were proved, by an examination of the blood, to be due to carbon monoxide. His Council desired the total abolition of carburetted water gas. Lord Belper had some difficulty in ascertaining from witness whether he considered that any small admixture of water gas was as bad as if it was used pure. The best reply he could secure was that the slightest amount of carbon monoxide was dangerous. To a certain extent, witness also considered that coal gas was dangerous; but his Council did not desire to do away with that. Dr. Haldane plainly put the point to witness, thus—"In many towns the coal gas contains about 12 per cent. of carbon monoxide. In Liverpool, on the other hand, I believe it contains about 5 or 6; and a mixture of water gas and coal gas there might contain a great deal less than 12 per cent. of carbon monoxide. Why, therefore, would you do away with water gas." Witness for a little time parried with the question; but at length he admitted that he was not aware before that in many cases coal gas contained more carbon monoxide than a mixture of water gas and coal gas in other places. Having been made aware of it, he said it would modify his opinion to a certain extent; but still he did not see why they should have carburetted water gas at all, seeing that they were surrounded by coal mines. He next charged carburetted water gas with being a "bad illuminant;" inasmuch as in a very short time the burners became perfectly black from the amount of carbon thrown upon them. He was not aware that this was much less the case when the carburetted water gas was mixed with coal gas; his experience having only been in using the former pure. "And from that," queried the Chairman, "you draw deductions with regard to using it mixed." Witness again confessed that he had no experience with the gas mixed with coal gas. Then, evidently feeling that he had not so far made a great impression, he added in a kind of helpless manner: "I asked my Council two or three times what I should say; and they said, 'Do away with it!'" Witness then produced the analyses made by Messrs. E. Davis and Son, which were referred to in the evidence of Mr. William King. These analyses, he admitted, were only made on April 5, 1898; and the accidents to which he had referred occurred about two years before then. The financial aspect of the question witness would have nothing to do with; he only looked at it from the safety point of view. It was suggested to him that he would also abolish paraffin oil and white lead; but he was not prepared to condemn everything as dangerous. The fifteen cases of poisoning which they had had occurred between 1895 and 1897;* but since the water gas had been supplied mixed with coal gas, they had not had any cases. Witness next complained of a nuisance of smell from the Garston Gas-Works, which he asserted made people ill and interfered with their health. The Company charged them the same price now as they formerly did for coal gas alone.

Dr. Arthur Newsholme, *Medical Officer of Health for Brighton,*

was next called. He stated that the use of water gas in Brighton was very limited. It began to be manufactured rather more than two years ago; and the largest proportion which was stated to have been mixed with coal gas about 40 per cent. This, he believed, would increase the amount of carbon monoxide from about 7 or 8 per cent. to nearly 15 per cent. These figures were based on the information supplied by the Company. The Corporation had not hitherto made analyses of the gas supply with a view to ascertaining the amount of carbon monoxide; but they proposed to do so in future week by week. As to any limitation of the quantity of carbon monoxide in the supply, he should certainly prefer to regulate it rather than prohibit it. He thought that one might make

* Witness subsequently supplied a table setting out the particulars of the injuries and deaths alleged to have been caused by carburetted water gas in the Garston district; but several of the cases which go to make up the fifteen appear to be very paltry examples. The first was a female servant, who was found in her room, in an unconscious condition, and she remained so for 72 hours, but recovered. A working man, named Rowe, was affected while drilling a hole in a gas-main, and was unconscious for fifteen minutes. Another working man, in connecting a gas supply pipe, was rendered unconscious for two hours. A police constable was found in his room unconscious. For two days an American visitor—a lady—was unconscious; and, like all the foregoing, she recovered. A Mrs. Lewis was unconscious for three days, and four days later died; but unfortunately no medical evidence was called at the inquest. Yarwood, a working man, was found by the side of his bed dead. Captain James was rendered unconscious for six hours. Then follow some rather amusing examples. One lady became faint from the smell of gas in church, and is said to have suffered for some time afterwards. Bad gas-fittings caused a Mr. Laken to suffer from palpitation and lack of breath and energy. A Mr. Row detected a smell of gas in his house, and experienced a choking sensation. Mr. Row's cook "became sleepy, nervous, made mistakes, and forgot things." A tap of a gas-stove not being turned quite off caused a Mrs. Gray, on entering her kitchen, to stagger out again. In another case gas escaped through the firing-back of a gas-stove; and, after a few minutes' exposure, Mrs. H. became "dazy," but recovered in the fresh air. The old water-gas opponent, Surgeon Lieut.-Col. Cayzer, winds up the list. Through a tap being left on in the porch of his house, he became faint and weak. He recovered; but felt uncomfortable all next day. Dr. Fisher in his evidence stated that this happened "late one night," and that, the gas so affected Dr. Cayzer, that he had "to go and sit on the step."

several recommendations on this point. First of all, he would suggest periodical official analyses. Secondly, that the results should be published, and that the public should be warned by the Medical Officer of Health of each district as to the danger of leaky pipes and fittings. Thirdly, he would suggest the desirability of the gas authorities being obliged to put on the meter in each house, and on the card on which the measurement of gas was recorded, a warning as to the danger of leaky pipes, and especially drawing attention to the necessity for flues to gas cooking and heating stoves. He further suggested the advisability, if the carbon monoxide in gas exceeded 10 per cent., of making the supplying authority partially responsible for bad fittings. For instance, they might be forbidden to allow the use of any stoves, either for heating or cooking, which had not proper flues connected with them to enable the products of combustion and the gas which was imperfectly burned to escape up the chimney. Finally, he suggested—that the list of nuisances given in section 91 of the Public Health Act, 1875, should be increased, so as to include cooking or heating stoves which were not provided with flues. Whether or not all these suggestions were practicable, he was not then in a position to say. He agreed that it would be difficult to make a gas company responsible for leaky pipes in a house; but it seemed to him that some standard of quality of pipes and fittings would be valuable. He believed steps had been taken to increase the water-gas plant at Brighton. What had astonished him when he visited the works was that the plant was so compact, and on such a small scale. It was evident the arrangements were more economical than those for providing coal gas. He should not favour gas companies being allowed to go to 25 per cent. of carbon monoxide in their gas, without much more stringent regulations as to the points he had emphasized. He only knew of two deaths from gas poisoning at Brighton in recent years. That was the case of two men who slept in an arch under the Esplanade in the King's Road, and were poisoned by an escape from a fractured main. He thought if regulations as to the size of burners and so on were specific, there would not be much practical difficulty in enforcing them. The primary responsibility for examining the fittings should rest with the gas inspector who periodically took the meter registrations; and the secondary responsibility to see whether or not the gas company had done their duty should rest with the inspector of the sanitary authority, who already had to visit the houses for other purposes, and could, without much difficulty, see that proper burners were there. A few questions forced witness to see that it would be very difficult to fasten upon a gas company any responsibility for old fittings, and fittings which they had no hand in fixing; but anyway he thought they might be made responsible for reporting defects. Witness did not agree that it was in the interests of gas companies that there should be defective fittings, as they, to his mind, damaged the reputation of a gas supply so much. He was strongly of opinion that any action which would leave the gas company out of responsibility would mean that any Act which was passed would be much more of a dead letter than it would be if they were included. Lord Belper intimated that his opinion was that if a law was to be carried out it must be enforced by somebody who had no interest in its being evaded.

Mr. Joseph Cash, *Engineer of the Brighton and Hove Gas Company*,

followed, and told an interesting story of experience and experiment in the use of carburetted water gas. He said the Brighton Company commenced the supply of this gas in January, 1896; and up to the date of his evidence they had produced about 450 million cubic feet. During that period, the proportions had averaged about 20 per cent. of water gas to 80 per cent. of coal gas; but these percentages were frequently varying according to the requirements of the works. At that time [June, 1898], for example, he was working about 40 per cent. of water gas; the reason being that in winter, although the plant might be running to its full capacity, the proportions, owing to the larger production of the entire works, were much decreased. The largest proportion of water gas he had ever made was 43 per cent. Constant tests showed him that the carbon monoxide in the coal gas varied from 8 to 9 per cent., and in the water gas from 28 to 32 per cent. In the mixed gases, it might be taken that the average worked out, though not quite, to a rule-of-three sum. For that year (1898), the average in January was 16 per cent., in February 16·5 per cent., in March 15·6 per cent., in April 13 per cent., and in May 15·5 per cent. In January, the highest return was 16·1 per cent.; and the lowest 13·9 or 14 per cent. The highest average he had ever had was 17·3 per cent. He had not the tests of the carbon monoxide at the time they were working with 40 per cent. of carburetted water gas; but if they were using 50 per cent., the average would come out at about 19 per cent. There had been no complaint made as to the use of water gas, either on the part of the Local Authorities or on the part of the consumers. He was rather interested in the result of a circular which was sent to the Corporation of Brighton, among others. Their Medical Officer (Dr. Newsholme) came and interviewed him. He inquired whether the Company manufactured water gas, and mixed it with the gas supplied to the public. He (Mr. Cash) replied that they did, and suggested that the Doctor should visit the works, and see the process of manufacture. He did so, and witness thought he almost converted him to approval of the process, which had been in operation for two-and-a-half years without any question having been raised as to its use. He chaffed Dr. Newsholme then upon the decreased death-rate of Brighton, which was now at, he believed, one of the lowest rates they had ever shown—about 11 per 1000. There had been another advantage—viz., they had been able to maintain rather an excess of illuminating power to the consumers by the use of carburetted water gas. He had also been able to reduce the sulphur compounds in the gas to the low figure of 10 grains per 100 cubic feet, which was uncommonly low. He wished also to inform the Committee of something else which he had never told anyone outside yet, because he wanted absolutely to confirm it. It was that carburetted water gas was the means of decreasing leakage or unaccounted-for gas in a gas-works; and it also caused the fittings of the consumers at the same time to be sounder, as there were less chances of an escape of gas. This, he thought, was a new theory; and it came about in this way: Soon after they commenced the use of water gas, he found that, from some cause which he could not then account for, the leakage was decreasing in a marked extent. In the second year it again repeated itself; so that they had nearly 2 per cent. less leakage, without anything being done out of the way in correction. This set him thinking; and he at last hit upon an experiment which he thought showed what was taking place. There was an absorption of a certain amount of paraffin or oily matter in the gas that was carried forward to the outlets (as he might term them) of the gas. The outlets were two—first, the burners of the consumers; and, next, the possible leakages where gas might be escaping. The burners being large enough were unaffected; but the minute cracks through which gas might escape in the fittings were gradually filled up. To make sure of this, he instituted an experiment. He took two pieces of glass, and fixed them into a frame of tin, keeping the orifices just open by the finest thread of cotton he could introduce at the lips (as he might call them) of these two pieces of glass, to represent the minute fracture or crack there might be in any place. He then allowed the gas to pass unconsumed through this at the rate of 5 cubic feet per hour. At first his test-meter showed no diminution at all; and the 5 cubic feet went on as regularly as possible. At length he was rewarded by seeing it gradually decrease, and through the glass he was able to perceive a kind of bridge of glutinous matter forming from each side of it. The bridge gradually united; and the passage of gas was reduced down in two months and a half—that was the length of the experiment—to $\frac{1}{2}$ foot per hour, without making any alteration. It went in at the same pressure, and was tested by the same test-meter. He pointed this out because it explained to a certain extent why his Company had had a large decrease in their percentage of leakage, and why he claimed that the minute leaks which existed in consumers' fittings were stopped by water gas. The figures he was going to give as to the diminution in leakage of course simply referred to the Company's premises and mains; but he was also going to tell the Committee something which he thought might convince them as to the effect on the consumers' fittings. In 1895 their unaccounted-for gas was 6·97 per cent. In 1896 it was reduced to 6 per cent.; and in 1897 to 5·09 per cent. This was a very marked decrease. Why he thought they had reduced the leakage in the consumers' fittings was that when they first commmenced using water gas, owing to its character, the smell became extremely pungent; and the number of complaints of escapes were very numerous. Of course, the Company dealt with all that they were responsible for; and the rest were referred to the gas-fitters. Complaints of escapes were now very rare indeed. He adopted another curious procedure to test these escapes, because, as he candidly told the Committee, at first he was very much opposed to water gas; and he determined that he would use every effort he possibly could to render all the consumers' fittings perfectly sound. People had got so used to what might be called the minute smell of coal gas, that he thought if he put a very obnoxious compound into the gas they would naturally notice the different smell. He alternated the supply occasionally for a day in a week, and so on, from coal gas to water gas; and then he used benzol, carburine, and other material of that kind. The smell of these was totally different from one another; and the consumer who would not notice just a little whiff of one thing soon noticed the alteration to another; and this to a great extent brought about the complaints which they received and had remedied. It was very rarely indeed now that anything in the nature of a complaint was made. He himself could detect the smell of carburetted water gas if there was the smallest leak, directly he entered the engine-house connected with the plant; but he had often noticed that the men who were working in it did not notice it. But to a stranger it was very noticeable. The oil which he generally used was, he believed, precisely the same as that employed by the London Gas Companies—American solar distillate; but the carburine, benzol, or benzol spirit, which had a different odour, was merely used by him to alter the smell. At the same time, the ordinary mixed gas was far more pungent than coal gas alone. Previous to adopting water gas, he had read a great deal which had prejudiced him as to its effect in America and other places. However, he had to judge upon the experience of his fellow-engineers who had used the gas; and he found that its distribution had not practically been detrimental to the inhabitants of their towns. Soon after he commenced to use it himself, he watched it carefully with regard chiefly to its effect upon the workmen who operated the plant, and were more especially exposed to the water gas. If there was any danger in water gas more than there was in coal gas, he thought he should experience a marked difference in what might be called the sickness or the casualties; but he found nothing of the kind—rather the reverse. The plant was worked easily; and had not produced any ill-effect upon the men by inhalation, nor had any accidents occurred by it. With regard to coal gas, he was sorry he could not say the same, because, unfortunately, they were rather too familiar with accidents in the retort-house. With water gas, they had had no casualty whatever; and if there was anything so very dreadful in it, it would certainly have been shown by the statistics of mishaps with the workmen. He had had no experience of using carburetted water gas pure or in very large proportions; but he should not hesitate, if necessary, to supply pure carburetted water gas, and take the responsibility on the part of the Company. From what he had read, the percentages of casualties where pure carburetted water gas was used in America had been decreasing. The increase in the carbon monoxide might possibly increase the danger; but he thought it would be found that, with the increased precautions which would be taken by any Company who adopted pure water gas, the number of cases of poisoning would be reduced. If pure water gas was going to be used in a town, he himself would give much greater attention, in the way of examination and testing, to the fittings of that town. Asked whether he was aware that nearly all the serious accidents to which the attention of the Committee had been called were not in consequence of small leakages, but owing to the gas being blown out or left on during the night, he said the answer was that coal gas would produce precisely the same results. There was another advantage which he had omitted; and it was this, that the use of the mixed gas improved the condition of a room. The presence of the carbon monoxide actually raised the flame temperature of the gas, and produced more perfect combustion—in other words, there were little or no products of combustion given off by it. This naturally improved the atmosphere of a room, and consequently, he thought he might say, the health of the inhabitants. It was pointed out to witness that the experiment he had referred to very much confirmed the evidence previously given as to the effect on burners of the supply of pure carburetted water gas. He replied that it might be found that, if the oil was not properly volatilized, the burner might get clogged, because they would have a formation of oily matter at the orifice of the burner which would probably form carbon; but if the oil was properly gasified they would not find that effect. In that case,

suggested Lord Belper, it would not tend to assist in the filling of cracks from which leakage occurred. Witness answered that with a large orifice, the carburetted water gas would have no similar effect to that which he had shown; it was the minute orifices just similar to the width of a thread where he found that it produced the result described. He took it that in the future his Company would use carburetted water gas to a much larger extent than now; and he really could not see any necessity for restriction. For example, water gas had been very useful in keeping the price of coal within reasonable limits. Only that morning the Company's coal contractor had told him that he should want a great deal more for coal next year; and he (witness) replied: "Very well, if you are going to increase the price to that extent, I shall have to increase the quantity of water gas for self-preservation." Brought back to the point as to restriction, witness said that once it was shown to him that a certain proportion of water gas was absolutely dangerous, or more dangerous than he ought to incur, he should limit his production to that; no gas company would wish to deliver anything to their customers which was prejudicial to them. He thought he would have a legitimate complaint if he were limited to the highest percentage of carbon monoxide he had mentioned—viz., 17·3, because he anticipated that shortly his Company would be producing 50 per cent. of water gas, which would give them an average (roughly) of 19 per cent. of carbon monoxide. He should probably work in the future to the 50 per cent. proportion; but he did not want to be limited to that, as coal strikes and other matters might compel them to fall back entirely on their water-gas plant. Questioned again regarding the experiment on the bridging over of small fissures in pipes by the use of carburetted water gas, he said he took it, although he had not proved it, that a similar action would occur with any gas enriched with a petroleum base. Respecting his statement that he believed the number of deaths was diminishing in the towns in America where water gas was used, he said his source of information was an American paper and a private communication he had received from a relative who was interested in gas matters in America. He did not always believe what appeared in the Press; he was no great believer in it. But as to the official reports from America, he would not for one moment say anything against them. He was very much surprised to hear that in Boston (where they used coal gas up to about 1890, and since had been gradually introducing water gas until now there was practically nothing but that gas used) the deaths had gone up from about one a year to fifty. Witness also appeared equally surprised when informed by Dr. Haldane that this information was published in the "Journal." Witness next described fully the circumstances connected with the poisoning of the two men in an arch at Brighton in September, 1896, which circumstances were reported in the "Journal" at the time. On the day of the accident, carburetted water gas was not being made; but in the gas supplied during the night there was a small proportion. The only other case they had had was the poisoning of the "boots" at Lancing College, when sleeping in a small room without a chimney. In this instance, according to the evidence at the inquest, the pin which served as a stop to the gas-tap was missing, and had been for some time; and the deceased appeared to have simply turned the gas out and on again. He believed the man could have been saved, but there was no doctor near, and one could not be procured for an hour and a half, by which time the man was dead. The following interesting passage took place—Dr. Haldane: Supposing that man was still alive when he was found? Witness: He was in the last case. Dr. Haldane: And supposing there was 15 per cent. of carbon monoxide there as against 8 in the coal gas, I think it is quite certain he would have lived if it had been coal gas? Witness: Do you not think the 8 per cent. would have killed him equally easily? Dr. Haldane: Certainly not; if he was still alive at the end of twelve hours with 15 per cent.? Witness: I could not tell you how many hours he had been in the room; but the statement of those who found the man was that he was apparently alive. That is all I can say, as I did not sift it; but when the doctor came he was dead. Continuing, witness said that unfortunately he could not produce any evidence to show that the man would have been dead with coal gas alone; and he would not like to experiment on anyone. They could only refer to what he might call medical evidence in these matters. The men who were employed on the water-gas plant, were working with (say) 30 per cent. of carbon monoxide as against the 14 or 15 per cent. sent out to the consumers; and, as he had said before, he had never found that this caused any inconvenience or illness among the men. Dr. Haldane remarked that it was with people who were asleep that the danger arose; and Lord Belper pointed out that he understood witness was arguing from cases which could not, under any circumstances, cause death. Regarding the inspection of fittings, witness considered this would be feasible; but the testing of them would be a more difficult thing. In the case of prepayment supplies (of which the Brighton Company then had some 5000 or 6000), they would not pass the fittings until they had had an official test. It would certainly be advantageous to have a test before gas was turned on into a new house or on a change of tenancy; but it would involve a certain amount of expense and trouble to the public. He took it that the new tenant would call in an experienced gas-fitter, whose duty, if he did his work properly, would be to make a test. But, as a rule, gas-fitters did not test the fittings under pressure, as he (witness) would recommend should be done. "Would your Company," inquired Lord Belper, "be prepared to have imposed on them the responsibility of keeping the consumers' gas-fittings in order?" Witness replied: "I certainly should not undertake a responsibility of that kind." But if, he added, the Company fitted up the houses originally, he would do so, because he would know that the material put in was good. The fittings that the Company had put in were not inspected afterwards; but the houses were visited quarterly by an inspector, who called to see that the fittings lent were in good order, and if there were complaints, he made inquiries, and had any defect remedied. In considering the economical aspect of water-gas manufacture, he said they had to take, on the one hand, the cost of coal and the value of the residual products, and, on the other, the cost of oil for the production of the water gas. These were the two factors; so that, if they had dear coal and the residuals were of low value, it would be cheaper to use, if they possibly could, the whole of the coke in the manufacture of water gas. Of his entire production of gas, 75 per cent. could be water gas if he used up the whole of the coke made. He thought it might probably come to that, because coal was going up by leaps and bounds, and oil was comparatively cheap. So that (Professor Ramsay said) any limit which could be possibly suggested would be objected to, on the ground that the Company might be forced, for economical reasons, to take the course of putting 75 per cent. of water gas into the supply. Witness gave a reply in the affirmative; adding that, if they were prohibited from doing this, it would compel them to increase the cost to the public. Supposing it was necessary to set a limit, what would you stand, inquired Professor Ramsay; and the answer came "Personally, I would stand the limit of 75 per cent." Of what? inquired the evidently astonished Chairman. "Water gas," answered witness. This, he admitted, would bring up the percentage of carbon monoxide to somewhere between 25 and 26; and he should expect a larger percentage to be found if anthracite coal was used, as was the case in America.

The ninth sitting was held on June 15, when

Mr. J. T. Westcott, *of the Economical Gas Apparatus Construction Company, Limited,*

was examined. He was first asked for his views regarding the statistics of accidents in America, and especially in Massachusetts, from the use of water gas. He said he thought a great many of the accidents were due to poor and obsolete fittings. In Pittsfield, Mass., he had met with fittings the keys of which had no stoppers, so that one could turn them on or off without noticing it. The deduction he drew from this was that, if the fittings had been in order, a great many of the accidents would not have happened. It was put to him that this did not affect the increase of accidents in comparison with the number which occurred when coal gas only was in use, with the same fittings. His answer was that he was of opinion that next year the number would be much less. The reason why so many accidents had occurred with the same fittings was that the coal gas was not purified enough; and many of the fittings were clogged with tarry matters. Then, when carburetted water gas was sent out *per se*, the water gas ate out the tarry deposit, and the obsolete fittings worked much easier. He thought that this accounted for the increase of deaths from poisoning since carburetted water gas superseded, or was added to, coal gas, with the exception of suicides and those caused by intoxication and probably some unknown means. Carbonic oxide was certainly one of the chief elements of danger in an escape of gas; but there were other gases in the composition of carburetted water gas and coal gas which were dangerous to life. The use of carburetted water gas really increased the danger to a very small extent; but he admitted that it would take a longer time to produce death with a small quantity of carbon monoxide than with a larger amount. Theoretically it would appear that the gas containing the greatest amount of carbonic oxide would cause most accidents; but, in practice, they were not led to the same conclusion. Take Edinburgh, for example, with 11 per cent. of carbon monoxide in the coal gas and Birmingham with 6 per cent., he thought statistics showed that there had not been any more deaths proportionately among the population in Edinburgh than in Birmingham, although in one case the amount of carbon monoxide was almost twice as much as in the other. He knew of cases in the United States where carburetted water gas had been sent out *per se;* and there had not been an accident for years. About five years ago, water-gas plant was erected at Pittsfield; and he had not heard of any accident during that period, with a population of something like 20,000. Regarding the particular places he had watched, he had not found any more accidents after, than before, the introduction of water gas, with the exception of Boston, in 1897; and he was of opinion that in this case there was something which they did not know that would account for it. His reason for believing that there would be a great decrease in the number of accidents was that he thought the obsolete fittings would be remedied. In every other place in Massachusetts, the result of supplying water gas had never been the same as in Boston; and in Toronto, where the proportion of water gas was about 50 per cent., a fatal accident was almost unknown. The average per centage of carbon monoxide in the gas there would be somewhere about 18.* He did not think any restriction should be put upon the use of even pure water gas; it should be left voluntarily to the gas companies. If the amount of carbon monoxide was restricted to 16 or 18 per cent., the Birmingham Corporation, for instance, would be allowed to use practically twice as much water gas as the Edinburgh Corporation, because the coal gas of the former contained such a low percentage of carbon monoxide. It was pointed out by Dr. Parsons that the reports mentioned that most of the deaths in Boston occurred in bedrooms in lodging-houses, which were made use of by low-class and ignorant people. Witness stated that, compared with other towns in Massachusetts, there was a larger percentage of that class of people in Boston and New York; and the larger number of deaths might be due to this greater proportion of that class, who misused the gas. He did not know positively that this was so. As to his assertion that the water gas dissolved away deposits in fittings, he said it was his experience that, when they started carburetted water-gas plant in any place, the tarry deposits were eaten out of the pipes and apparatus by the gas. Lord Belper mentioned that some photographs had been produced which showed that the use of pure water gas had the effect of clogging the burners; and witness ascribed this to the water gas not having been properly purified and condensed. They had had one case in America where the same thing happened. Improper purification, condensation, and scrubbing allowed the gas to collect a percentage of iron from the mains, and deposit it at the burner as a sort of iron carbol.

Mr. Tatham, *Statistical Superintendent of the General Register Office,*

was at this stage recalled, and supplemented his previous evidence by producing a list of deaths which occurred in England and Wales in 1896, and were returned as having been due to "suffocation." He said he had excluded a large number which were obviously unconnected with carbonic oxide poisoning; and of the deaths enumerated in the list, a considerable majority were those of very young children, which the Committee might think it right to exclude from consideration. But there were 24 deaths

* A letter, dated June 29, from Toronto (subsequently submitted) stated that during the previous year there had not been one death from gas in the town, and that the average was not more than about one a year, with something like 24,000 consumers, and an output of nearly 700 million cubic feet per annum.

remaining which might well be worth further inquiry.* Having regard to the great importance which attached to the registration of the actual cause of death, it appeared to witness desirable that, in every case where an inquest was held, there should be appended to the Coroner's certificate, in addition to the finding of the Jury, either (1) a medical certificate of cause of death; or (2) short particulars of the medical evidence given at the inquest, whether or not there had been a post-mortem examination.

The tenth day on which evidence was taken was June 30; and the first witness was

Mr. A. C. Humphreys, *of Messrs. Humphreys and Glasgow,*

who devoted (specially for this inquiry) considerable time to collecting and tabulating statistics and information relating to the deaths attributed to water gas in America.† Commencing his examination, witness stated, at the request of Lord Belper, the technical position which he holds in America. He also showed the unusual opportunities that were afforded him, during the ten years he occupied the office of Chief Engineer and General Superintendent of the United Gas Improvement Company of America, for gaining a wide experience in the supply of water gas. The Company, he mentioned, controlled some sixty gas undertakings in about forty cities; and being the owners of the original Lowe water-gas patents, they installed at all their works water-gas plant, either alone or as an auxiliary. The result of his practical experience did not lead him to think there was any considerable additional danger in the supply of water gas. Of course, he had to face the fact that in three cities especially—Boston, New York, and San Francisco—the records *seemed* to show an increased death-rate; but he did not believe that, under ordinary conditions of distribution, and with ordinary care, in practice water gas would be found more dangerous. Lord Belper remarked that it was clear by witness's report that he laid greater stress on the necessity in America for looking closely into and regulating the gas-fittings than upon the demand for any legislation limiting the amount of carbonic oxide in the gas. Witness said that was so, and he showed that he had always felt the necessity for a complete control over house fittings from the time he first took charge of a coal-gas works in Norfolk, Virginia, more than 25 years ago. Any illuminating gas, he observed, was highly dangerous to breathe; and those who were responsible should take every possible precaution that was practicable to guard its proper distribution. It seemed that the Committee who conducted the Massachusetts investigation had an idea that all danger could be eliminated by having at regular intervals a systematic inspection of the fixtures. Of course, this was not practicable; the companies could not do it. But witness's idea was that pipes and fittings should be first put in under adequate inspection and control, and that, if they were ever opened, it should be under the same inspection. The pipes in new houses should also be tested by subjecting them to a pressure of from 5 to 10 lbs.; and after the ceilings, walls, and floors had been closed in, the proving should be again performed. Indeed, no gas should be turned into a building until the pipes were certified to be absolutely tight. It was suggested to witness that what he advocated would not meet the cases of death and illness caused by gas being turned on when it was not lighted. He admitted that it would not completely, but said it would probably prevent some of the cases caused by flimsy fixtures, and especially chandeliers and brackets fitted with cocks which failed to indicate by stops when the gas was turned on or off. In the poorer portions of many cities, there were still a surprising number of these dangerous fixtures in daily use. Undoubtedly the conditions under which gas was supplied in America by open competition led to much more chance of escape, and much more carelessness in regard to fittings, than in this country. He did not consider that greater stringency was necessary where water gas was used than with coal gas, unless it was to meet popular clamour. In his mind, there was not the slightest doubt that many of the deaths from gas inhalation recorded as accidental were, in fact, suicidal; and one or two of the cases quoted in his report showed that, where deaths from gas poisoning had increased, the deaths by suicide from all causes had increased in somewhat the same ratio. It was his opinion that the discussion which had gone on in the United States had shown the public that illuminating gas was dangerous to breathe, and that suicide could be committed by its use. He did not think the people as a rule got into their minds any distinction between the gases; and if a man stopped up all the openings in a room, it mattered little which gas was used. Witness was reminded that he had not made any suggestion for the purpose of meeting the cases of suffocation by carbonic oxide in this country when the gas was left on, or accidently continued to flow, during the night; but this, he said, was almost beyond control. How, he asked, was it possible to give a man intelligence enough to treat gas properly if he had not already got it? He did not believe it would be practicable to impose a standard delivery of gas at the burners. But supposing, inquired Professor Ramsay, such a regulation was restricted to places inspected in any way, would it then be possible; and witness said he thought so, if they had the means of governmental inspection and control. The Boston Commissioners, Lord Belper pointed out, stated that only 3 per cent. of the gas accidents were due to faulty fittings; so that if witness's regulation in regard to the fittings were adopted, it would not meet the case. Witness answered that he did not claim that it would; it would simply be a small step. He advocated inspection apart from any question as to the relative danger of the two gases. Whatever the dangers to be feared from water gas or from coal gas, they could not be coped with by fittings regulations alone; where a man or a woman could interfere with the gas appliances, then the safety or danger must finally depend upon their own intelligence. He also showed, in reply to questions, the impracticability of fitting up houses with pipes of very small diameter, or of restricting the pressure in the mains to (say) 1 inch, in order to limit the supply of gas. The latter course would tend to greatly increase danger rather than diminish it. Compared with other means of accidents, the casualties connected with the distribution of gas had been few; and he could not find that water gas had changed this condition of affairs. Regarding the statistics as to deaths in Boston from illuminating gas, he believed the total figures were practically correct, but that many of those reported as accidents should have been stated as suicidal. He did not know much about similar records in this country; but his impression was that the cases had not in the past been reported so closely as they might have been. In 1891, for example, there seemed to have been a change in the method of classification. Under the general heading of asphyxia, a great number of cases—some 290—were reported with the added remark "manner not stated;" but the agitation on this subject would doubtless lead to more complete records. Great care should certainly be exercised in analyzing the records for Great Britain as well as those for the United States, before any comparison was attempted; and above all the investigator should not fail to take account of the differences in the conditions of life in the two countries. He had found nothing in his daily experience to show him that water gas was more dangerous than coal gas. He had constantly gone into cities in America and compared results, and found that the testimony against water gas as compared with coal gas would not stand careful analysis. When he came to England he was unable to get any testimony that the introduction of water gas had led to one additional death, although it had been used largely for a number of years. He thought the manufacture of water gas was likely to increase; and he was decidedly of opinion that it would be a great hardship to limit the amount. Reverting to the Boston statistics, he said there was quite a discrepancy between the Commissioners' reports and those issued by the Health Officer.

Mr. Isaac Carr, *the Engineer of the Widnes Corporation Gas-Works,*

was next called. From his investigation of the question of water-gas manufacture in this country, he said he had arrived at the conclusion that, taking the most favourable figures, the manufacture of water gas cost practically double that of coal gas. In making this comparison, he took the figures referring to his own works, and those published by the various users of water-gas plant. According to these statements, the average cost of water gas was 1s. 3d. per 1000 cubic feet—that was, with entirely new plant, where the expense of maintenance was low. His comparison on the same lines gave him 5·3d. per 1000 feet of coal gas. If he took the whole of his charges into the manufacturing price, it came out at 7·4d.; and the average illuminating power of the gas was 18·16 candles, tested by Sugg's "G" argand burner. The price charged for gas at Widnes was 1s. 4d. and 1s. 6d. per 1000 cubic feet. The 7·4d. was the cost into the holder; and then there was interest on capital, standing charges, and sinking fund, which amounted in 1897 to 5·2d.—making the total cost a trifle under 1s. 3d. per 1000 cubic feet. He was quite sure that he would be able to sell gas at a still lower price. He had just reconstructed his works so that they would be capable of producing double the quantity of gas, and then the standing charges would be reduced from what they were at present. He saw no reason why they should not sell gas at 1s. per 1000 cubic feet. The profit made out of the supply was limited to the extent of 2½d. per 1000 cubic feet. He employed Wigan coal principally. Asked the price paid for it, he replied that that was the secret of the cheap gas at Widnes—he used slack. He selected a good seam of coal and purchased the slack. For gas-making purposes it was almost as good as screened coal. He knew that a great many engineers did not agree with him; but the position at Widnes was, he thought, a sufficient justification. The cost of screened coal from the Wigan Arley mine was 10s. per ton at the pit; and the slack from the same seam was half the price. When this was worked up into gas, the difference in the result was not more than 10 per cent. His carbonizing figures compared with those at Liverpool were 11·1d. against 1s. 9d. He assumed it cost him quite as much to carbonize; so that practically the whole of the difference would be in the cost of the coal. If he allowed for the difference in illuminating power—that was, 3 candles, at 1d. per candle—the difference in cost between the two towns was 10d. per 1000 cubic feet. If they made water gas at Widnes, they would have to raise the price of the gas. In making a comparison of the cost of coal and water gas, a great deal depended upon the locality. For instance, at Belfast they were in a most favourable position for water-gas manufacture. Witness knew of no place in England where the introduction of water gas had brought about a reduction in price. At Widnes he obtained 6s. a ton for coke; but at Belfast the circumstances were most exceptional, inasmuch as, by introducing water gas, they had been able to double the price of their coke. It used to be 9s. a ton, and now it was 17s. or 18s.; and further extension of coal-gas plant would have necessitated entirely new works—a departure which the Belfast Authorities were, he understood, very much opposed to. For enrichment, witness used tar. To face emergencies with coal gas alone, he found a storage equal to twenty-four hours' maximum consumption was quite sufficient. The amount of carbonic oxide in his gas was about 4 per cent. What he did not understand was that some of the gas suppliers who had gone in for water gas were putting up the price of gas; for it was a notorious fact that all the gas companies throughout the kingdom who were selling gas under 2s. per 1000 cubic feet were not, according to the latest returns, makers of carburetted water gas.

Mr. James Stelfox, *Gas Engineer of the Belfast Corporation,*

followed. He stated that carburetted water gas had been in use in Belfast since the end of 1893. At first the percentage of water gas averaged 25; but since the plant had been extended, they had sent out as high as 60 per cent. This was the maximum; the average of the year being 35 or 36 per cent. He only remembered one case of gas poisoning. Professor Lorraine Smith had told him of another; but he himself really knew of no other case.* His feeling was that carburetted water gas was as safe as coal gas; it seemed to him they were both very deadly things to use. He was aware that there was a much larger percentage of carbon monoxide in water gas than in coal gas; but he had always considered there was sufficient

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* An investigation, so far as possible, of these cases did not show that any were those of gas poisoning. But it did disclose evidence in many instances of specific causes of death, which, if returned, would have taken them out of the vague category of "suffocation."

† Appendix VI. C, which was submitted to the Committee by Mr. A. C. Humphreys, deals with American statistics and reports relating to the comparative danger of water gas and coal gas. The appendix covers no less than seventeen pages, and embodies several valuable letters and tables, some of which were prepared by Mr. Walter S. Allen, who was at one time connected with the Boston Gas Company, and at another period was Secretary of the Board of Gas and Electric Light Commissioners. Space will not permit of these numerous documents being dealt with at the length which is really required to do them justice; and therefore we must refer interested readers to the official report.

* It will be remembered that this evidence was given on June 30 last year.

in coal gas to do mischief. At Belfast, carburetted water gas had cheapened their production very much, because it had relieved them of charges for cannel, and had also enabled them to sell coke to better advantage. But he did not attach so much importance to this as to the relief it had given in other ways. Since 1893, there had been two reductions of 3d. in the price of gas. The original price was 2s. 9d., with discounts up to 20 per cent.; and it was now 2s. 3d., with the same discount. If they were restricted in their output of water gas, it would be most inconvenient and hurtful. They seemed only to have got out of their difficulties by adopting water gas; and a large increase might be expected in the future. His opinion was requested as to restricting water gas to 30 per cent.; but he said any restriction would have to be the subject of a test. They might be working up to the limit of carbonic oxide permissible; and then require to put on additional water-gas plant in order to meet the demands for gas. Looking to the future, any restriction of a serious sort would necessitate immediately putting their fresh coal-gas works in hand, because they could not extend on the present site. It was on this account that they took to water gas in the first instance. Witness also pointed out the possibility or desirability of using non-luminous gas with Welsbach mantles. He believed that an experiment had been already tried in Vienna in this direction. His general view was that water gas was not more dangerous to health than coal gas, and that there was no necessity for placing any special restriction upon its use. If anything was done, it should be in the direction of giving the Corporation powers in regard to the fittings of the consumers. He did not think any serious evil could arise except during sleep. The Corporation, he was sorry to say, had no inspector of gas-fittings; but the electric light people were much more particular.

(*To be concluded next week.*)

THE ST. PANCRAS VESTRY AND THE LOCATION OF GAS-MAINS.

Arbitration Proceedings.

In the "JOURNAL" for the 19th of April last year, reference was made to a dispute which had arisen between the St. Pancras Vestry and The Gaslight and Coke Company as to the position of certain new mains in the parish and the removal of disused pipes from the subsoil of the streets. The subject was brought under the notice of the Vestry by the Highways Committee in the following report:—

The attention of your Committee has been drawn by the Engineer and Surveyor to the objectionable practice of The Gaslight and Coke Company, when laying new mains in the parish, of leaving the old disused mains in the ground; and the Engineer to the Gas Company has declined to remove such old disused mains when requested to do so, and has given notice of his intention to lay a 4-inch main under the footway in College Place, instead of in the line of the old main under the roadway. In the 109th section of the Metropolis Local Management Act, 1855, it is provided that "no Gaslight Company shall at any time break up or open any pavement or surface of soil for the purpose of laying down any new mains or pipes without the consent in writing of the Vestry or District Board;" but the Metropolis Gas Act, 1860, gives power to the Secretary of State to authorize gas mains and pipes to be laid down by Companies in accordance with the provisions of that Act, where the Local Authority refuse or delay their consent. In the case under present consideration, no absolute refusal has been made by the Engineer and Surveyor, acting on behalf of the Vestry, but in fact he has given a conditional consent—the condition being that the main shall be laid in the course of the old trench, in order to ensure the taking up of the old main; and the Company's officials refuse to take up old mains when laying new ones in a different part of the street. The Gas Company have given notice of their intention to appeal to the Board of Trade if the Vestry persist in the attitude adopted in the matter. Irrespective of the expediency of requiring the removal of old mains, there are tangible objections to be raised in some cases against the use of the footways for gas-mains. The principal one from the Vestry's point of view is that, as the Electric Lighting Authority, it is highly desirable they should reserve the footways for the use of the Electricity Department, for supplying the public as well as the public lamps; and it may also be considered desirable to protect the inhabitants from a possible source of danger by the too close proximity of gas-mains to dwelling-houses, if the mains were laid under the footways.

This report was adopted without discussion—the action of the Engineer and Surveyor being approved; and it was decided to inform the Company that the Vestry would be prepared to contest the matter before the Board of Trade if the threatened appeal should be proceeded with. This was done; and the question was submitted to the arbitrament of Major-General Scrope Hutchinson, R.E., C.B., under the provisions of the Board of Trade Arbitration, &c., Act, 1874. The proceedings took place at the St. Pancras Vestry Hall, towards the close of last year, and extended over two days; Mr. Claude Baggallay, Q.C., appearing for the Company, and Mr. Corrie Grant for the Vestry. We have been favoured by the Company's Solicitors (Messrs. Bedford, Monier-Williams, and Robinson) with the printed minutes of the hearing, from which the following particulars are extracted.

In opening the proceedings, Mr. Baggallay said there were two questions at issue between the parties. One was whether the Vestry had power to dictate to the Company the position in which a gas-main should be laid in the street; and the other, whether, in giving their consent to the breaking up of streets, they could make it a condition that existing mains which had become useless—generally known as "dead" mains—should be removed. The application of the Company was made under section 54 of the Metropolis Gas Act, 1860, as amended by section 3 of the City of London Gas Act, 1868; and they asked that the consent of the Vestry might be dispensed with. The facts were shortly these: On the 26th of February, 1898, the Company's Inspector for the Northern Division of London (Mr. Fenn) wrote to the Surveyor of the Vestry (Mr. Blair), enclosing a plan showing the position in which it was proposed to lay the new mains in College Place. He also gave formal notice that he intended to open the ground within three days. On the 1st of March, Mr. Blair replied that Mr. Fenn had not shown on the plan any existing main; and he wished to know if there was one, and, if so, its position. Mr. Fenn answered the inquiry the next day by stating that there was a 2-inch main in the carriage way, 12 feet from the railings on the west side—that was a few feet from the kerb—but none on the east side. Mr. Blair thereupon said he intended to bring the question of dead mains before his Committee; and, in the meanwhile, he withheld his consent to the application. There were in College Place some public lamps and 66 houses, of which 41 were supplied. This was the first time in the parish of St. Pancras that any attempt had been made in any way to control the Company with regard to the position in which they had laid their mains, or to impose conditions with regard to the removal of the dead mains. He thought there could not be any doubt that the fact of the parish being an electric lighting authority, under a Provisional Order of 1883, had some bearing on the question, and might have influenced them in the course taken; and this made it necessary that the Company should be protected. The two points raised really came to the same result. The point raised that a Local Authority could control the position of the mains, the Company contested; and he did not think there would be any doubt, at the end of this inquiry, that the Vestry had determined to keep the footways free from gas-mains with the view to reserving them for the laying of electric cables or other electric apparatus. With regard to the condition as to the removal of dead mains, it came to this, that if they were to be compelled, whenever they laid a new main, to remove the old main, they would have to open a trench to take out the dead main, in which case the only economical way of carrying on their business would be to lay the new main in the line of the trench. There could not, so far as they could see, be any other reason than the one he had suggested for insisting on the removal of these mains, which in 99 cases out of 100, if not in all cases, could lie in the ground as a portion of the soil, and do no harm or cause any inconvenience whatever. This was an exceedingly important question to the Company. In a district covering 62 square miles, and in which they had some 1500 miles of mains, the Arbitrator's decision would be of the very greatest importance. One which would place the Company under the control sought by the Vestry would have a very material effect in the cost of carrying on the undertaking, and consequently upon the price of gas, and both directly and indirectly would affect very much not only the consumers but the ratepayers. The Company were ratepayers in London to the extent of upwards of £165,000 a year; so that they were very much interested in the matter. He was sure the Arbitrator would not lose sight of these facts in considering the important effect which the decision of the Board of Trade would have upon the undertaking.

Mr. Baggallay called Mr. G. F. L. Foulger, the Company's Chief Distributing Engineer, who stated that it would be of advantage to lay two 4-inch mains under the footways on either side of College Place, in lieu of the present 2-inch main under the road, so as to have them as near the houses as practicable, and thus allow of a very much shorter length of service-pipe being used. Having enumerated the disadvantages attending the use of long service-pipes—viz., the liability to sag and facilitate condensation, and the formation of naphthalene deposits difficult of removal—he said there was the further question of expense. It was cheaper; and the cheaper the Company could do their work, the better it was for the consumers (who, under the sliding-scale, were now partners with the Company) and the proprietors. Since the adoption of the "penny-in-the-slot" system, almost every house required a service. It was more economical to lay the mains in the first instance under the footway than under the roadway, whether paved or macadamized. The dangers were greater to a main in a macadamized road, because such a road frequently had steam-rollers passing over it. With regard to dead mains, the Company's practice had been, unless they were going to put the new main in the line of the old one, simply to exhaust the gas, seal up the pipe, and leave it. Not the slightest advantage would accrue to anybody by taking up the old main, which really became part of the subsoil of the road. He had never known any accident, damage, or inconvenience to result from their practice; and though their district embraced nearly 200 parishes, he had never heard this question raised before. He did not know any reason why it should be undesirable that the gas-mains should be under the footway in College Place; for, even if there were electric mains, there would be sufficient width to allow of them being laid without any interference or undue proximity, as they had to be kept 6 inches at least away from each other. He was prepared to admit that, both for electrical apparatus and gas, the best positions were in the footways; but if there were not room for both, he would be prepared to give way to an electric lighting company.

Mr. Foulger was cross-examined at some length by Mr. Corrie Grant. Asked what it was going to cost to lay the 4-inch main under each footway in College Place, witness said that, speaking generally, small mains cost 1s. per inch diameter per yard to lay; so that a 4-inch main would cost 4s. a yard—8s. the two. If he took up the 2-inch main, and replaced it by a 6-inch, it would cost about 7s. a yard. With regard to dead mains, witness was asked if it had never occurred that the men thought they were working on a live one when it was actually dead. He said it had not; but he would not go so far as to say that, from ignorance or the stupidity of some workman, such a thing might not happen.

In re-examination by Mr. Baggallay on the question of cost, witness said the maintenance of, and access to, the mains after they were laid came into consideration very much more than the original outlay upon them. The questions of easily making connections and executing repairs, and the removal of the risks attending service-pipes crossing sewers or going under gullies, were of more importance than the original cost.

In answer to questions by the Arbitrator, Mr. Foulger stated that there would be a considerable length of streets in St. Pancras in which the mains were laid under footways, because it had been their practice, especially since Electric Lighting Provisional Orders had been granted, to do all they could to make their mains as safe as possible; and they had elected to go under the footways. If they placed a main under the footway on the west side of College Place, if the electric mains were in that position they would be just outside the gas-mains—quite close to them. In the City of London, in many cases they were almost touching; but no objection had been taken to their proximity. All one had to do was to see that the insulation was perfect.

The next witness was Mr. G. Wallace, the Engineer and Surveyor to the St. Giles's District Board of Works. He said he thought it of the greatest advantage to both companies and consumers for 4-inch gas-mains to be put under footways; and in every instance in which he had an opportunity—not in respect of gas-mains only, but others—he required it to be done. Taking a street where the space under the footways was not occupied by mains or pipes, unless there was some difficulty created by vaults, he should prefer the service mains to be laid under the

footways, and should use strenuous efforts to compel it. As to the removal of old mains when new ones were laid, he had never required it; and, unless the new main was going to occupy the same trench as the old one, it would, speaking in the public interest, be highly objectionable to remove it. Presuming that the dead main had been properly freed from gas, he should certainly think it an unreasonable condition to impose upon a company that, before they put down a new main, they should take up the old one. In answer to the Arbitrator, witness said no expense would devolve upon the Vestry in the removal of a dead main, if a company who wanted to occupy the ground came along and there was no room for them. The new-comer, whoever he might be, would bear the expense of taking up the main. Mr. Corrie Grant remarked that the case might arise of the Vestry wishing to occupy the ground for a sewer, to which Mr. Baggallay replied that then it would be simply a question of the difference between the cost of removing an old pipe and any other material of which the ground might consist.

Mr. George R. Wheeler, the Engineer and Surveyor to the Westminster Vestry, followed. Dealing first with the subject of dead mains, he said that, in practice, he never found any difficulty arise from allowing these disused pipes to remain in the ground. When the Vestry were excavating for a sewer, instead of taking up earth they simply lifted the pipe, and no additional expense was incurred. On the question of laying mains under footways, he said it was most desirable to put them there, especially where the roads were macadamized, as damage was likely to arise by the use of the steam-roller.

Mr. Alfred Colson, of Leicester, the last witness called for the Company, characterized as "perfectly absurd" the imposition of a condition that dead mains should be removed from the ground. If they had said, "We refuse our consent to this main being removed, and insist upon its being left in," he could have quite understood the refusal as being reasonable. But to ask for a main to be removed was to him a most extraordinary thing. In his own experience he should never dream of doing it. As long as it remained in the ground it formed a thoroughly good foundation, and was practically indestructible. But if a main had to be taken up, no difficulty or expense was entailed—the idea that there was, was altogether a "mare's nest." As to laying service-mains, his practice was to put them under the footways, as the result of a report on the subject he had made to his Committee, who unanimously adopted it. As the Electric Lighting Engineer as well as the Gas Engineer of the Leicester Corporation, he had laid electric lighting mains by the side of the gas-mains under the footways. They were within 12 inches of each other, and at an average depth of 9 inches—say, between 6 and 15 inches. At Leicester they laid their gas-mains in duplicate—one on either side of the street. He had authority to put down more than six miles of 4-inch mains, and every yard would be laid under footways. He found this much better than laying a larger main in the middle of the roadway, for the reasons given by Mr. Foulger, whose evidence he fully endorsed. In answer to the Arbitrator, Mr. Colson stated that the Leicester Corporation were the authority for everything—sewers, gas supply, and electric lighting—and there was no conflict of interest at all.

This was the case for the Company.

Before addressing the Arbitrator on behalf of the Vestry, Mr. Corrie Grant asked Mr. Baggallay to deal with the question whether the definition of the word "street" in section 3 of the Gas-Works Clauses Act, 1847, entitled the Company to go under the footpaths at all. Mr. Baggallay acknowledged that the word "footway" or "footpath" was not mentioned; but he thought it was impossible to come to any other conclusion than that these words were included. He contended that "street" obviously meant the roadway and the footway on either side. The whole street, from side to side, was part of the "thoroughfare" or "highway," both of which words were included in the definition. If "street" did not include the footway, the Vestry themselves would not, under the Electric Lighting Acts, be authorized to lay electric mains beneath the pavement. The Arbitrator inquired how this question would be affected by mains a'ready laid under footways in St. Pancras. If the contention was right that there was no power to lay them, would not, he asked, they all be illegally there? Mr. Baggallay replied that they would. However, he did not think there was anything in the argument on the question of the word "street."

Mr. Corrie Grant then proceeded with his address. His first point was that the Company had no right to break up footpaths and lay their mains under them, because the definition of the word "street" in the General Act of 1847 did not include the word "footpath." He argued this matter at some length; contending that the words used in the definition of "street" in the Gas-Works Clauses Act, 1847, when compared with the definition in the Metropolis Local Management Act, showed that "footway" was to be excluded. But supposing, for the purposes of his argument, that his learned friend was right in claiming for his clients the power to break up footpaths and lay mains, he then came to his second point, which was that, if the statutory rights of the Company extended to footpaths, the possession, control, and management of the soil of the street was vested in the Local Authority, so far as was necessary for their purpose. Having cited the leading case of *Coverdale v. Charlton*, and other cases, in support of his argument that the right of the Vestry to control the soil of the street was absolute, the learned Counsel came to his third point—viz., that the Vestry did not refuse their consent—in support of which he quoted the correspondence which had taken place between the parties. His next point was that there had been a difference in the Vestry as to the plans; and that therefore the proper course for the Company to have taken was to go to the Justices and ask for their decision on the matter. His final point was one entirely for the Arbitrator—viz., whether, putting aside every legal consideration, the plan proposed by the Vestry was not better than that proposed by the Company. He should show that it was impossible to lay a 4-inch main down the west side of College Place, and that it was more expensive to lay a main under the footpath on the east side; and therefore he suggested that the Board of Trade ought to decide that the Vestry were right in their contention, and that the Company should lay a larger main in the roadway. With the size they had nothing to do; it was the place for which they were contending.

The first witness called for the Vestry was Sir Alexander Binnie, the Chief Engineer of the London County Council. Taking the question of dead mains, he said it was most undesirable that they should be left in the ground, as they rendered the carrying out of new work extremely difficult, and caused delay and expense. As to putting gas-pipes under footpaths, it would depend upon local circumstances. There were instances where the road was so crowded that another main could not be put in; and in that case the parties would be driven to lay it under the footpath. Asked by Mr. Baggallay if, when he had charge of the water-works at Bradford, witness ever abandoned any mains when he laid new ones, he replied that he could not say whether he did or not; but in the majority of cases the old main was taken out. In London, in the case of sewers, the abandoned ones were filled up and cut off, and no inconvenience was experienced. In answer to questions by the Arbitrator and Mr. Corrie Grant, Sir Alexander emphasized his previous statement about the inconvenience of leaving dead mains in the ground.

The next witness was Mr. S. W. Baynes, the Electrical Engineer to the St. Pancras Vestry, who expressed the opinion that the laying of gas-mains under the footways in College Place would cause considerable inconvenience, as the Vestry would have to put down the electricity supply mains for lighting the streets. There would be three on each side for the private lighting; and on the west side, where there were vaults, there would be one or two for the arc lighting. In his opinion, there would be very little, if any, room under the footpaths for the Gas Company's mains. They had already experienced difficulties in many ways in carrying out the electric lighting of the parish owing to the presence of the gas-mains under the footpaths. They had been forced out into the road. Difficulty and expense had also arisen through the presence of disused gas-mains. One which interfered with the erection of a post, was thought to be a "live" main; but, on being drilled and tested, it was ascertained to be dead. In his opinion, the whole of the footways on both sides of College Place would be required for the electric lighting. In answer to the Arbitrator, witness said he thought they would require about 7 feet of space for electric mains on the east side of College Place (where already there was a main of the Hydraulic Power Company), and some 18 inches on the west side. He added that it was advisable to have their mains as far as possible away from the gas and water mains—in fact, from all metallic pipes—because, in searching for faults, they interfered with the localizing of them.

Mr. Baynes was followed by Mr. W. N. Blair, the Engineer and Surveyor to the Vestry. He gave details of the inconvenience he had experienced in connection with disused mains in the parish, and said it was undesirable that they should be left in the public roadways. His principal reason for objecting to the Company laying their 4-inch pipe under the footway in College Place was the desire to prevent the multiplication of pipes by endeavouring to get them to put it in the course of the existing main. He ascertained from the Electrical Engineer that his department would soon have to make large demands in regard to College Place. Then there were vaults on the west side; and it was undesirable to have a gas-main over them. Moreover, there would not, according to his measurements, be room to lay a 4-inch main without cutting into the arch. He was distinctly of opinion that the balance of convenience was in favour of laying a larger main in place of the old one. In cross-examination by Mr. Baggallay, witness said the first occasions when he asked for the removal of an old main were in October and November, 1897, before which time the Company had frequently laid mains under the footways, and had often—too often, in fact—put in new pipes without removing the old ones; and the Vestry had not taken any action. Their patience became exhausted, however; and then they formally stood out for their removal. Mr. Blair was shortly re-examined by Mr. Corrie Grant, and was then questioned on several points by the Arbitrator and the learned Counsel. Asked if, supposing it were practicable to lay gas-mains under the footway in College Place, they should, having regard to the electric main, be placed next the kerb or next the railings, he replied that he thought it would be preferable for them to occupy the latter position, there being an area between the footway and the houses in this particular road.

Mr. Blair was followed by Mr. William Weaver, the Chief Surveyor to the Vestry of Kensington, who expressed the opinion that the footways should be reserved for the purposes of the highway authority; while with regard to dead mains, he thought it highly desirable that they should be taken up in some cases, but that a certain amount of discretion and reasonableness should be used in enforcing their removal. In Kensington, the electric light mains were almost invariably laid in the footways; and if the gas-mains were placed there, and the Vestry afterwards required their removal, they had always paid for it. In cross-examination by Mr. Baggallay, witness said he had not the slightest doubt that the introduction of steam-rollers in the Metropolis led the Gas Companies to lay their mains in the footpaths rather than in the roads. Asked if he could suggest that there was any disadvantage in doing so, except where some electric lighting body wished to put their mains under the pavement, he replied that he could not, only he thought the footways should be reserved for purposes for which the roadways could not be used—for such things as could not be placed there with the same security that a gas-main could. At the same time, he had not since 1882 objected to the footways in Kensington being used for gas-mains. He had required the removal of several disused mains.

The last witnesses called were Mr. Charles Harlow Lowe, the Surveyor to the Vestry of St. John's, Hampstead, and Mr. James Patten Barber, who holds a similar position in connection with the Islington Vestry. The former said he considered 3 feet from the kerb, under the roadway, the best place for gas-mains; while with regard to dead mains he thought it was not desirable to leave them in the ground where they could be taken out. Mr. Barber was also of opinion that it would be a convenience if disused pipes were removed. On the question of the location of mains, he considered that each case should be dealt with on its merits. Taking the one in question—that of College Place—having regard to all he had heard about vaults on one side of the road and electric lights on the other, he should have advised the Highways Committee of the Vestry, in dealing with the Gas Company's application, to show a case in which the mains had better be laid in the roadway.

Mr. Baynes was recalled to answer a few further questions, and the case for the Vestry closed.

Mr. Corrie Grant then addressed the Arbitrator. He said the Vestry had not dealt with the question of dead mains until they were compelled to do so by the crowded state of the roads. He urged that they were the recognized statutory authority having control of the roads in the parish,

and that, so long as they exercised their powers reasonably, they had no right to be interfered with; and, further, that in the particular case under consideration they had exercised them with a great amount of reason. They simply asked, as between two methods of dealing with the Company's application, that one should be chosen which was as beneficial in carrying out their requirements as the other would be; while the one was far more important to his clients (the public authority) than the other.

Mr. Baggallay said the only question the Board of Trade had to deal with was whether or not the consent of the Local Authority should be dispensed with. It was not a question of condition, but one of authority—whether the Vestry had or had not the power to withhold their consent, or, if they had, whether they should be allowed to exercise it. If the case he had established—and he thought it was practically admitted—that the chief reason for the Vestry withholding their consent was to send the Company into another position, and that their ulterior object was, not as the highway but as the lighting authority, to carry out their electric lighting scheme, then he submitted that this would be a ground for the Arbitrator deciding that the consent had been improperly withheld, and therefore should be overridden. He argued that Parliament never intended that the Company should be subjected to anything more than the reasonable control of the Vestry in the interests of the public using the surface of the roadway. It never meant that the powers conferred by the Metropolis Local Management Act in 1855 might be exercised in controlling the laying of mains by the Company. He urged that they had the right to place their mains under such part of the street, including the footway, as was most convenient for the economical and safe carrying on of their business, and as they thought would be least likely to interfere with the traffic. He claimed this right, and submitted that any withholding of consent which interfered with its exercise was an act which could not be supported.

The Arbitrator expressed his thanks for the assistance given to him, and the inquiry closed.

Major Hutchinson presented his report in due course; and the Board made their award on the 28th ult. After briefly setting forth the circumstances under which the application had been made to them, they authorized the new mains to be laid down by the Company without the consent of the Vestry.

THE LONDON COUNTY COUNCIL AND THE GASLIGHT AND COKE COMPANY'S BILL.

At the Meeting of the London County Council last Tuesday—Mr. T. M'Kinnon Wood in the chair—the question came up for decision, as required by the 4th section of the Municipal Corporations (Borough Funds) Act, 1872, whether the Council would oppose The Gaslight and Coke Company's Bill now before Parliament, and out of what funds the cost of such opposition should be paid.

Mr. Cornwall (Chairman of the Parliamentary Committee) moved—"That the Council do oppose The Gaslight and Coke Company's Bill, against which it has resolved to present a petition; and that the costs and expenses of and incidental to the said petition, and the proceedings consequent thereon, be charged to and paid out of the county fund." He said the motion sufficiently explained itself. They had to proceed with their opposition to the Bill, and, under the Borough Funds Act, a special resolution was necessary.

Mr. Easton said before they voted he should like some further explanation on the subject, for it was impossible for those who were not members of the Parliamentary Committee to be cognizant of the reasons which animated the Chairman in bringing forward this motion. If the money the Company were seeking powers to raise was to be applied to purposes injurious to the interest of the community, or for any ends which did not recommend themselves to the Council, they could safely vote for the resolution; but he, for one, would like to know for what reason they were asked to oppose the Bill.

Earl Russell, in seconding the motion, said if the honourable member would read the motion he would see that the Council had resolved to present a petition against the Bill; so that the merits of the case had been considered. The present was only a formal resolution.

Mr. Cohen, M.P., said he did not rise to offer any opposition, but to give some information which the Council might consider material, and which might induce them to share his belief that it would be an absolute waste of money to oppose the Bill. He did not offer this opinion out of friendship for The Gaslight and Coke Company, whose oppressive charges in the North of London he had done his best to resist. He wished simply to inform the Council that that afternoon Mr. Pickersgill, the member for Bethnal Green, had moved the rejection of the Bill in question in the House of Commons. His motion was negatived without a division; and his instruction, couched in the same terms as a motion of his (Mr. Cohen's) which he had blocked, was ruled out of order by the Speaker. The Chairman of Committees had pointed out to Mr. Pickersgill that the grievances for which he was interested in obtaining redress were in no way cognate to the Bill he was resisting; and he did not see how, by opposing the Bill, the honourable member could obtain any redress. If, after this information, the Council were of opinion that Counsel should be instructed to oppose the measure, he did not think it would be of the least use.

Mr. Westacott sincerely hoped the Council would agree to the motion. Whenever The Gaslight and Coke Company were applying for some favour which would benefit the share capital, it was the bounden duty of the Council to lay before a Committee of the House the facts relating to the matter. Even if they failed, he hoped they would put forward the strongest possible case. They in North London were being unduly punished; and as the Company were going to Parliament, it was their duty to see that the facts as to the charge for gas were laid before the Committee, so that the gas consumers on the north side of the river might at all events be treated as considerately as those on the south side. He most cheerfully supported the motion, and hoped the Parliamentary Committee would do all in their power to oppose the Bill, and get better terms for the consumers in North London.

Sir J. Blundell Maple, Bart., M.P., remarked that he had been in the House of Commons that afternoon, and he could assure the Council that it would be a perfect waste to spend money in opposing the Bill. The object Mr. Westacott wished to achieve was not to be obtained in that way. The Bill, he would see, was a very simple one, to give power to the Company to raise more money on debentures, subject to the auction clauses; and the Company were asking for this money so that they might supply penny-in-the-slot gas-meters to the poorer individuals. Throughout the whole of the Bill there was no point on which Counsel could be employed to raise the question which Mr. Cohen had sought to bring forward. The Council were quite right in employing lawyers to fight anything in the interest of the ratepayers; but they might rest assured that this particular Bill did not raise any question which could interest the ratepayers of London, or which would not be looked after by the members in the House of Commons. The question Mr. Westacott wished to deal with would never arise on the Bill, as had been mentioned by the Speaker from the chair.

Mr. Cornwall said the Council had the particulars of the Company's proposals before them when they resolved to petition Parliament; but he would answer Mr. Easton's question. The Company were now going to raise £3,500,000; and, as advised by the Council's officers, this money would probably last about twenty years, so that they might not come to Parliament again for this period. Consequently, the present opportunity to appear before the Select Committee to whom the Bill would be referred ought not to be lost by the Council; and they should endeavour to get some satisfaction as regards the price of gas—satisfaction in the direction indicated by Mr. Westacott.

Mr. Beachcroft said he should like to know why action of the nature contemplated was likely to prove hopeless. He remembered well, when the last Bill of the Company was before the House of Commons, they were told that that was not a convenient opportunity for raising the question of a reduction in price. They were told to wait until the Company applied to Parliament for power to raise more capital. Now they had an application by the Company to raise £3,500,000, and they were told that it was quite hopeless to raise the question in the House of Commons, and that in doing so they would only be throwing away their money. Even if they did waste their money they would be very much misunderstood if they did not take action. It was because he knew how much the population on the north side of the Thames suffered by reason of the high price charged for gas as compared with the south side, that he supported the motion.

Earl Russell raised, as a point of order, the question whether there could be further debate, seeing that the Chairman of the Committee had replied.

The Chairman ruled further discussion out of order, and proceeded to put the motion, which he declared was not carried by a sufficient number on a show of hands. He therefore called for a division. This having been taken, he declared the motion carried by 90 votes to 3.

NEW INCANDESCENT (SUNLIGHT PATENT) GAS LIGHTING COMPANY, LIMITED.

The Third Ordinary General Meeting of this Company was held at Winchester House, last Wednesday—Mr. J. H. Duncan in the chair.

The Secretary (Mr. Ernest Hely) having read the notice convening the meeting, the report and accounts for the year ending June 30, 1898, were presented. As briefly mentioned last week, the accounts showed a loss of £9396 on the year's working. In the report, the Directors stated that the period covered by the accounts had been one of much disturbance in the market, because of the introduction of new features in the trade; and the Company's arrangements had also been at a great disadvantage in consequence of changes in the management. These circumstances had contributed to the production of the adverse balance shown in the profit and loss account. The Directors regarded as an essential of the Company's policy the adoption of a white light calculated to compete with the ordinary incandescent mantle; and last September they felt satisfied that it was necessary to organize its manufacture on a proper basis. Early in December a beginning was made with sales; and a large business was being carried on. They had also succeeded in producing a very simple burner constructed entirely upon the principle of the Company's patent, and had named it the "Simplex" incandescent burner. While increasing the light-efficiency, it dispensed entirely with a chimney, and was of extremely simple and cheap construction.

The Chairman, in moving the adoption of the report, said he was in a position to show the proprietors that the Company had now a mantle which gave a light quite equal to that of their rivals; while with respect to the Kern burner without chimney, about which they had heard so much lately, the Company had in their "Simplex" burner, also without chimney, one that was quite equal to it, and in some respects superior. Turning to the accounts, he said the expenses for the year 1897-8 had amounted to £13,604, of which about £5000 had been spent in what might be called advertising. Their gross profit was £4201, against £780 in the previous year. This was some advance; but it was nothing like what it ought to be if they were to cover the dead expenses. The question they had to face was that of turnover. Their gross profit was better than ever before, because they now knew where to get their goods at the cheapest rate, and how to turn out their burners at the lowest figure. They had arrived at a solution of the commercial difficulties that had at first beset them, their legal position was safe, and all they required now was the means with which to fight their rivals with strength and energy. But in order to carry on the battle satisfactorily, it was necessary to put new life into the concern. By reconstruction they would get rid of their old losses, and would be able to start afresh. He had every confidence that the Company had a successful future in store; and he thought it would be very unwise for the shareholders to abandon the contest just when success was about to be attained.

After a few remarks, in the course of which the Chairman of the Shareholders' Committee (Mr. F. Walker) urged the proprietors to support the Directors in finding more money to place the Company's new light on the market, and to carry on their warfare against people who considered they could interfere with its sale, the motion was carried.

A Committee of four was then appointed, with power to add to their number, to confer with the Directors on the subject of formulating a scheme of reconstruction.

THE LONDON CHAMBER OF COMMERCE AND SECRET COMMISSIONS.

Some time ago, the London Chamber of Commerce appointed a Special Committee to investigate the subject of secret commissions. Mr. David Howard, J.P. (Vice-President of the Chamber), and Mr. Walter Hazell, M.P., were respectively elected Chairman and Deputy-Chairman of the Committee; and representatives of trade and professional associations apart from the Chamber and other gentlemen were added, to make the Committee more thoroughly representative. No less than twenty of the trade sections of the Chamber were represented by either their Chairmen or Deputy-Chairmen. With the view of obtaining evidence as to the prevalence of secret commissions in the various trades, and the extent to which they obtained, the Committee caused communications to be addressed to the members of the Chamber, the various Trade Associations, and Chambers of Commerce, as well as to the public at large by the insertion of a letter published in the various trade papers and the Press generally, asking for information. In response to these invitations, the Committee received numerous communications on the subject, both written and verbal. Most of them were accepted under a promise that they would be treated as strictly private and confidential; but in a few cases the persons giving the information were not unwilling for their names to appear.

The report of the Committee has now been issued. They much regret that only in the way above set forth were they able to obtain information, as they are fully conscious of the value which would attach to communications made public with all particulars and substantiated by the names of the parties communicating them. At the same time, in no case have the Committee come to a decision except upon evidence which they believe to be trustworthy. They conclude from the evidence before them that secret commissions in various forms are prevalent in almost all trades and professions to a great extent, and that in some trades the practice has increased and is increasing; and they are of opinion that it is producing great evil, alike to the morals of the commercial community and to the profits of honest traders. Bribes in all forms, including secret commissions, owe their existence sometimes to the desire of the donor to obtain the assistance of the donee; sometimes to the demand expressed or implied of the donee that the bribe shall be given. The bribes given naturally take many forms. Most generally they take the simple shape of a money payment, the worst form of which is a *pro ratâ* commission on the business done; but at others they take the shape of a loan, which places the borrower at the absolute mercy of the lender, who, if he be dissatisfied with the amount of custom he receives, can call in, or threaten to call in, the loan. Sometimes the bribe consists of presents of plate, wine, or other things; and not infrequently it is administered in the form of lavish hospitality and treating. One frequent practice with those who venture to put their offer of bribes on paper, is to describe the sum offered as a "discount," though the offer is made, of course, not to the principal, but to his agent. The Committee say that the mass of corruption which the evidence before them shows to exist may appear to some persons so great and complex, as to render it hopeless to struggle towards purity. But they do not take this view of the matter. They believe that the discussion of the subject and the publicity of some cases before the Law Courts have already done some good; and they recall the undoubted fact that corruption formerly existed in this country in regions where it is now entirely unknown. They accept the improvement which has taken place in these directions during the last fifty years as a fact full of encouragement for the commercial community of Great Britain. The question of whether it is desirable to introduce legislation to check the abuses which still remain, has been considered by them. If it is to be attempted, it appears to them that it should render criminal "the payment, the receipt, the offering, and the solicitation of any corrupt payment; and also the giving of any invoice or other document calculated to enable the recipient to commit a fraud upon his principal." They think it is expedient that such legislation should be initiated by the Chamber, or supported by a petition by them.

In the meantime, and independently of legislation, it appears to the Committee that much may be done if only the community will rouse themselves to the task; and with this view they make the following suggestions: The more frequent enforcement of the civil rights of the principal; which rights, they are advised, may be thus stated—

(*a*) A master or principal may recover from his servant or agent everything which has been received by him by way of secret commissions in the course of his service or agency, and if the accounts have been settled between the principal and his agent, and it can be shown in a single instance that the accounts are tainted with fraud or wilful omission, the accounts may be reopened, and the agent be required to restate and verify them by oath.

(*b*) A master or principal may as a general rule dismiss without notice, or without payment in lieu of notice, any servant or agent who has received and not disclosed a bribe.

(*c*) A contracting party may repudiate and rescind any contract entered into through an agent who has received a bribe from the other side.

(*d*) A contracting party may recover from the briber, and the bribed, or either of them, any sum which he has paid under the contract, and which in consequence of the bribe was in excess of the fair or market price.

(*e*) A contracting party whose agent has been bribed by the other party during the execution of the contract may, in spite of its being part performed, rescind and recover what he paid, both to the briber and the bribed.

The Committee further suggest that all professional and trade bodies (such as those representing the medical, legal, artistic, and other professions and trades) be recommended to make an emphatic declaration on the subject of secret commissions, and adopt the course already taken by the Royal Institute of British Architects, the Institution of Civil Engineers, and other bodies, by inserting into their bye-laws a stipulation that any member guilty of the pernicious practice will be expelled the Society by the Council. In order to make such a provision effective, this would require the aid of the general public, as well as of the members of the several professions and trades. The Committee also think that traders should make with all with whom they deal a definite agreement, similar to that entered into by the members of the Calico Printers' Association, undertaking that nothing in the form of a bribe, commission, or present shall be offered or given by them to anyone.

The Committee consider it would be highly advantageous if masters and principals, when entering into engagements with servants and agents, would call attention to this subject, and make the refusal of all bribes an express, instead of an implied, term of the contract of service or agency. Such an explicit stipulation would probably give moral as well as legal support to servants and agents in resisting the temptation when offered under the pretence of a thing which is always done. They are also of opinion that much good in many cases may be done by circulars or notices warning against the payment or receipt of bribes. They believe something may be done to check commissions by the exercise of increased vigilance on the actions and proceedings of the servants and agents employed, especially of buyers and salesmen and of persons employed to inspect and pass goods. If principals would always inquire for themselves why goods were refused, or why advice is given hostile to the particular manufacturers or tradesmen, they would sometimes find that the defect was not in the goods, but in the bribe. This necessity for vigilance applies with special force to the case of public institutions, such as workhouses, hospitals, asylums, and to large commercial joint-stock concerns, such as railways and to co-operative stores. They point out that in many cases buyers and others who are employed in very responsible positions, and have very important duties to perform, are paid inadequate salaries, and are thus rendered especially liable to the temptation of accepting bribes. This, in their opinion, demands the careful consideration of the heads of firms.

The Committee suggest that the existence of a great system of technical education throughout the country should be utilized as a means of disseminating clearer views than often exist of the immorality of giving and receiving bribes. The managers of these institutions would, no doubt, give the necessary permission and allow influence in the right direction to be brought home to the young people in their schools, whether by means of written papers or of oral addresses. The Committee recommend, in conclusion, the holding of a public meeting to call the attention of the public and all concerned to the heinousness of the system of secret commissions, and its detrimental effect upon morals and business.

The report is followed by appendices containing excerpts from statements, letters, papers, and other documents submitted to the Committee. The greatest care has been taken to see that these statements have been made on reliable authority; but, necessarily, the Committee and the Chamber do not accept responsibility for their absolute accuracy.

SUGGESTIONS FOR EXTENDING THE INCANDESCENT GAS SYSTEM.

Phenomenal as has been the development of the incandescent system of gas lighting during the past few years, the idea is pretty generally entertained by managers of gas-works that it has by no means reached its limit. Much has been done by them to bring under the notice of the consumers the advantages which the system unquestionably possesses; and their efforts have been rewarded by a success which they scarcely expected. They have used the means at their disposal; and their action has borne good fruit. But, conscious that incandescent gas lighting is capable of still further development, requests have been forwarded to the Welsbach Company to suggest any methods by which it may be brought into more general use. This they have done in a circular-letter addressed to the companies with whom they do business. They point out that the benefits of the system are such as to render it not merely a luxury or a show light, but an indispensable adjunct to the use of gas as an illuminant. As the efficiency of a Welsbach burner per cubic foot of gas consumed is ten times that of the ordinary open-flame burner—viz., 25 as against 2½ candles per cubic foot—consumers have the option either of greatly increasing their light or considerably reducing their gas consumption, or they may split the difference. The system, therefore, should appeal equally to the poorest and the richest classes. At the same time, the economy of gas does not result in any decreased sale. On the contrary, there is every indication that the improvement effected has given a great impetus to the gas industry, and has in many instances been the means of displacing the electric light.

The foregoing observations serve as a general introduction to the suggestions offered by the Company, the first and most important of which relates to the upkeep of the burners. What is the reason for many people refraining from adopting the incandescent gas-light? Chiefly an exaggerated apprehension as to the cost of renewing the mantles. There are two alternative methods of upkeep which the Company suggest. The first is to inspect the customers' burners fortnightly—cleaning them out, putting them generally in order (exclusive of renewal of mantles or chimneys), and charging such a price as would pay for the labour bestowed thereon. It is thought that 2s. 6d. per burner per annum would be more than ample. By such inspection the burners would be kept in perfect order, as it is chiefly owing to their being dirty that the difficulties arise. The alternative system is an annual payment by the customer for the absolute upkeep of the burner, including the renewal of the mantles. The Company themselves undertake this at 8s. per burner per annum; but they think that in smaller towns, and where the mantles are not subject to such unfavourable atmospheric conditions as in London, they last much longer, and consequently the charge might be reduced. Another suggestion thrown out is that the introduction of incandescent gas lighting would be facilitated if the burners could be installed in houses on the hire-purchase system, or even simply on hire. This, however, would depend very largely on local conditions. The final suggestion in the circular is one which has been put forward in these columns any time during the past twenty years, and been acted upon with undoubted advantage. It is that gas companies should have show-rooms in a prominent part of the town, where burners, stoves, and other appliances could be exhibited, and their special qualities pointed out. The advantages attending the opening of such an establishment are emphasized by a correspondent whose communication on a Provincial Gas Company's enterprise appears in another part of the "JOURNAL." The suggestions thrown out in the circular-letter certainly merit the consideration of those to whom they are addressed.

CAGLIARI GAS AND WATER COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held on Tuesday last, at the London Offices, No. 3, Lothbury, E.C.—Mr. JOHN AIRD, M.P., presiding.

The SECRETARY (Mr. W. P. Peat) read the notice convening the meeting; and the report and accounts were then submitted. The former stated that the receipts on revenue account for the past year amounted to £23,229, and the expenditure to £12,330; leaving, after the usual deduction for the sinking fund, a net revenue of £10,899. The amount available for distribution, including the balance brought forward, was £15,665, out of which an interim dividend at the rate of 6 per cent. per annum was paid for the six months ending the 30th of June last (£4500). The Directors recommended a dividend at the rate of 8 per cent. per annum for the past half year, amounting to £6000 (making 7 per cent. for the year), and a bonus of 2s. 6d. per share. These payments will amount to £11,437, and leave to be carried forward a balance of £4228. The gas receipts increased by £1172 as compared with those for 1897; while the expenditure went up £422, owing entirely to the greater cost of coals and high freights. The gas unaccounted for averaged 4 per cent. of the make over the entire year.

The CHAIRMAN, in moving the adoption of the report and accounts, first referred to the death of the Company's local Manager (Mr. Craig), who, he said, was an old and faithful servant, and had done his best in the interests of the Company for the long period of 32 years. He was never a strong man; but he had always been anxious to throw all the energy and power he possessed into his work. He died in November last, respected and esteemed by all who knew him. Referring to the accounts, the Chairman said that, having regard to all the circumstances, he thought the shareholders would agree with the Board that the year had been a satisfactory one. They were able to pay the same dividend and bonus as last year; and they were hopeful—he was especially so—that next year, if all continued to go as well as now, they would be in the position to increase the bonus. The shareholders would notice that the revenue both from water and gas had advanced; but the expenses had also somewhat increased, and so lessened the advantages that would otherwise have accrued. It was particularly gratifying to the Board to notice that the investment they made in taking over the water supply of Pauli—one of the largest villages in the country—had proved to be very successful; and they had had a good return from it even this the first year. There was no doubt also that the inhabitants had considerably benefited by the Company taking the supply into their hands. There was nothing special to record regarding the water supply during last year, excepting one unfortunate incident. In November, there was a terrific thunderstorm, which did much damage to the city and neighbouring villages. In two-and-a-half hours 6 inches of water fell; and the extraordinary rainfall brought an accumulation of débris into the Company's reservoirs. This had to be removed at some, though not a serious, expense; and it disturbed somewhat the filtration arrangements. He was glad, however, to be able to tell the shareholders that the main which conveyed the water to Cagliari, in spite of this deluge, held its own in a wonderful manner; and the Directors regarded this as a most satisfactory feature, and a great safeguard in the event of any future difficulty of this sort occurring. They were also glad to learn of the able way in which the staff grasped this difficulty, and spared no exertion to put the supply in perfect order again. It might be interesting to note, having regard to the controversy on the subject in this country, that the Company fulfilled all requirements by the supply of 17 gallons of water per head per day. About one-fifth of the houses were supplied by meter; and 593 houses were fitted up by the Company, the tenants paying a yearly rental. Turning to the gas supply, the Chairman said the year had been exceedingly satisfactory. The works, the Board were assured, were in good order, though through old age two benches of retorts would have to be renewed during this year. The Directors were also arranging to renew the service-pipes from time to time. They found there was an end to the working life of service-pipes; and if they were not renewed after the lapse of twenty years, not only was the supply to the houses interfered with, but a very considerable waste of gas was apt to result. This was a matter that had had the Directors' attention for some years past; and it was especially having their care now, having regard to the large increase which was taking place in the supply. He might mention that in the past year the increase in the consumption was no less than 13 per cent., and in the number of consumers 20 per cent. They had maintained the illuminating power; and they held a position which was very remarkable, inasmuch as the supply in Cagliari was second only per head of the population to any other city in the country—Milan being the only one that took precedence. The Board attributed the great increase during the past year to the benefits that had arisen by following the advice given to the Company by their friend Mr. Simmelkjor, and strongly supported by Mr. R. S. Gardiner, who for many years was officially connected with the Imperial Continental Gas Association—that was to arrange a system of differential rates, so as to encourage the consumption of gas for heating and cooking. This had proved a complete success, and a great benefit to the inhabitants. It had also been beneficial to the Company, because it had regulated their supply better between the day and night. This system had altogether been so successful that the Company had thought well to approach the town with a view to an extension of their concession, which expired in 1906, as they felt that a great deal more could be done in this direction, and that it would be of considerable service to Cagliari. But the Company would only be justified in doing this by having a longer term in which to deal with their works. It would be interesting to the shareholders to know that, while the Company had been a prosperous one, and they had had a fair return for their outlay and exertions, nevertheless they had not been selfish; because, taking, for instance, the price of gas, under the concession they might have charged throughout for private lighting no less than 11s. 4d. per 1000 cubic feet, but the actual price had been 6s. 9½d. for private lighting, and 4s. 6d. for cooking and heating purposes. Therefore he felt sure that the authorities of Cagliari, in giving consideration to this matter, would not be forgetful of the benefits the Company had given the people now for some twenty years past. The Directors had also, in the interests of the Company, and to further the wishes of the Syndic and authorities, put down an electric lighting plant for special purposes. They had done this not with any view of gain so much as in the hope that they would meet the wishes of the authorities, and do all they could for the city itself. Among other points, the Chairman mentioned that the residual products had realized 80 per cent. against the cost of coal; and this the Directors considered satisfactory. Another matter was that, although the taxation was less for the year, exchange had been somewhat higher, so that the one about balanced the other. He also spoke of the indebtedness of the Company to their lawyer in Cagliari (Mr. Sanna), whose brother they had temporarily appointed as chief since the sad death of Mr. Craig. Mr. Simmelkjor, who was in Cagliari at the time, wisely made this arrangement, and also that he should be assisted by Messrs. Meloni and Webster, and their staffs. One and all had done their very best to prevent any inconvenience arising in the conduct of the Company's business. The Chairman concluded by referring to the cordial relations which continued to exist between the Board and the Syndic and authorities of Cagliari.

Sir FREDERICK WIGAN, Bart., seconded the motion, which was carried.

The dividend and bonus recommended in the report having been declared,

The retiring Directors (Sir F. Wigan and Mr. John Aird) and the Auditors (Messrs. H. Bishop and R. S. Robb) were re-elected.

The proceedings terminated with the usual complimentary vote to the Chairman and Directors.

HARROW AND STANMORE GAS COMPANY.

The Ordinary Half-Yearly Meeting of this Company was held on Monday last week, at the Albion Tavern, Aldersgate Street, E.C.—Mr. CHARLES HORSLEY, J.P., in the chair.

The SECRETARY (Mr. J. L. Chapman) read the notice calling the meeting; and the report and accounts were taken as read.

The CHAIRMAN said he was sorry to have to inform the shareholders present that Mr. Glaisher had for some little time been very much indisposed; and though now better, he was not well enough to be with them that day. There were one or two matters to which he would like to call their attention. The gas made in the half year under review amounted to 34,785,000 cubic feet, which was an increase of 2,964,000 cubic feet over the same period of the previous year. Of this they sold 31,402,000 cubic feet—being an increase of 1,746,000 cubic feet, or 5·88 per cent. The quantities sold in the various districts of the Company were as follows: Harrow, 17,281,000 cubic feet; being an increase of 782,000 feet, or 4·73 per cent. Sudbury and Harrow Weald, 3,925,000 cubic feet; being an increase of 284,000 feet, or 7·79 per cent. Stanmore, 6,606,000 cubic feet; being an increase of 40,000 feet, or 0·05 per cent. He must say he could not quite understand the slight increase that had taken place in the last-named district. The amount of gas supplied for public lighting was 3,590,000 cubic feet; being an increase of 640,000 feet, or 21·70 per cent. They had used 296 tons more coal. The make of gas per ton was 10,224 cubic feet, and the quantity sold 9230 feet. Unaccounted-for gas amounted to 8¼ per cent. of the make. This was higher than usual, but at the same time it was a reduction of 3 per cent. on the June half of last year. Turning to the accounts, it would be seen that the gross receipts were £8305, which was an increase over the December half of 1897 of £559. The gas-rental was £6839, or £354 more; rentals of meters, stoves, and fittings amounted to £322, or £28 more; and residuals realized £1152, or £177 more than in the corresponding period of the previous year. Regarding the last-named item, he might say that they had received £90 more for their coke, £4 more for tar, and £82 more for sulphate of ammonia. The total expenditure was £5713. There had been a slight increase in wages, more money had been spent on repairs, and £100 had been written off suspense account. The profit for the half year was £2591, which was an increase over the corresponding half year of £83; and after the dividends which the Directors recommended had been paid, there would be a balance of £50 to carry forward. This, to his mind, was a very satisfactory state of affairs indeed. He concluded by moving the adoption of the report and accounts.

Mr. A. H. BAYNES seconded the motion, which was carried unanimously.

The CHAIRMAN then proposed the payment of dividends at the rates of 7½ per cent. per annum on the original "A" capital, 7 per cent. on the additional "B" capital, 5½ per cent. on the additional "C" capital, and 6 per cent. on the guaranteed shares—all less income-tax.

Mr. BAYNES seconded the resolution, which was adopted.

The CHAIRMAN next rose to propose the re-election as a Director of Mr. James Glaisher, who retired by rotation. In doing so, he said that Mr. Glaisher had been Chairman of the Company ever since they obtained their Act of Parliament; and he also took the chair at the meeting at which it was arranged that the Company should be floated. The Company could not have a better Chairman. Any balance-sheet that Mr. Glaisher brought forward and supported, might with confidence be adopted by the shareholders. He was very clever at figures, and was spoken very highly of by everyone who knew him.

Mr. BAYNES, in seconding the proposal, said he had been for a number of years associated with Mr. Glaisher. He thought the Company were very fortunate in having him as Chairman. His name was universally known, and as universally respected; and no Director had given more constant attention to the affairs of the Company than had Mr. Glaisher. He was glad to say that Mr. Glaisher was as clear now in intellect as ever he was.

The motion having been carried unanimously, the retiring Auditor (Mr. James Randall) was re-elected.

On the proposal of Mr. A. F. PHILLIPS, seconded by Mr. T. H. MARTIN, a vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN, having returned thanks, proposed a similar compliment to the officers and staff.

Mr. S. CUTLER seconded the motion, which was carried.

Mr. CHAPMAN, in acknowledging the vote, said that he was exceedingly pleased with the balance-sheet. He thought it was the best by a long way that they had ever had. The place was taking the turn that Mr. Glaisher had so often wished it would take; and every day they were laying on fresh consumers. Regarding the small increase in consumption in Stanmore, to which the Chairman had alluded, this was simply owing to the fact that for some time they had had phenomenal increases in the district, so that for a year or two it might stand still.

PROVINCIAL GAS COMPANIES.

The report of the Directors of the Dartmouth Gas Company, which was submitted at the annual meeting yesterday week, stated that during the year debentures to the amount of £2500, bearing interest at 4 per cent., had been renewed at 3½ per cent. With regard to the plant, the coal-stores had been thoroughly repaired; but the new purifying plant referred to at the preceding annual meeting had not been provided, and it would be necessary this year to replace the existing apparatus at a cost of about £800. The total receipts amounted to £3590, and the expenditure to £3160. Out of the balance of £400, the Directors recommended payment of a dividend of 13s. per share, or at the rate of 10 per cent. The report was adopted, and the dividend recommended was declared.

At the half-yearly general meeting of the Dover Gas Company, held on Monday last week, the Directors reported that, notwithstanding the reduction in price made in July last, the amount received for gas sold in the six months ending Dec. 31, 1898, was £12,436, as compared with £12,281 in the corresponding period of 1897. In common with the experience of other gas companies, the cost of coals and wages had increased; but the profits had been adequate to meet the ordinary dividend within £550—an amount which the surpluses of previous years were amply sufficient to meet. The Directors therefore recommended the declaration of the usual dividend for the half year at the rate of 7½ per cent. per annum, less income-tax.

The past half-year's working gave the Hayward's Heath Gas Company a balance to the credit of profit and loss account of £2347. Out of this it has been decided to pay a dividend of 6½ per cent. on the original capital and £4 11s. per cent. on the additional capital; making 11½ and £8 1s. per cent. respectively for the year. After paying these, £1718 will remain to be carried forward. The Directors have resolved to reduce the price of gas by 3d. per 1000 cubic feet from April 1.

The revenue of the Leominster Gas Company for the second half of last year was £4015; the expenditure, £3077—leaving a balance of £938, out of which the Directors recommended, at the half-yearly meeting last Tuesday, the payment of dividends at the usual maximum rates on both classes of shares. The consumption of gas for private purposes was 17,231,600 feet, which is more than 7 per cent. above that for 1897. The increased use of gas was no doubt stimulated by the reduction in price made in that year, and also by the enlarged mains. The increase has continued during the present quarter.

The report adopted at the annual meeting of the Sittingbourne Gas Company last Wednesday showed an available balance of £2564. It was agreed to pay a dividend of 7½ per cent., to place £400 to the reserve fund, and to carry forward a balance of £920.

At the recent meeting of the Swindon New Gas Company, the usual dividends—viz., 4½ per cent. on the preference stock, 10 per cent. on the ordinary stock, and 5 per cent. on the new stock—were paid. The number of new applicants for gas has been at the rate of 600 a year. During the past half year, 30,300,000 cubic feet of gas were consumed; being an increase of 4,500,000 cubic feet, and just double the quantity sold in a twelvemonth seven years ago. Much satisfaction was expressed by the shareholders at the progress of the Company; and this was testified by an increase in the Directors' fees.

The report of the Directors of the Tunbridge Wells Gas Company, submitted at the recent annual meeting, showed that the capital account had been a little altered, as £3250 of debentures had been issued, and produced an average £128 3s. 8d. per cent.; this being higher than any previous issue. The capital account had been overdrawn to the extent of £2918; and it was proposed to create £5000 of new stock. The cost of coal and carburine for the manufacture of gas was £522 more than the previous year; and there had been used 21,058 tons of coal, against 20,770 tons in 1898. The carburine employed was very much less than before. The total cost of the manufacture of gas was £28,903, as compared with £28,236. The sale of gas had increased—the revenue therefrom being £30,081, against £29,711. Tar produced £125 less; but sulphate of ammonia was £200 better—the total residuals producing £9099, against £7663 before. The number of automatic meters had also augmented from 1930 to 2053, and consumed 1,500,000 cubic feet more gas. They had collected something like a million pennies, or 10 tons of coppers, from the meters during the year. After paying the usual dividends, a sum of £1895 was carried to the reserve fund. The report was adopted. A special meeting was afterwards held, at which the Directors were authorized to issue £5000 of "D" stock. The Chairman (Alderman Delves) mentioned that forty years ago gas in Tunbridge Wells was 6s. 2d. per 1000 cubic feet, and the Company's revenue £3044. Last year the price was 3s., and their revenue was £27,944.

The report of the Directors of the Tynemouth Gas Company, to be submitted at the 33rd annual meeting of the shareholders next Tuesday, states that the revenue for the year amounted to £37,155, and the expenditure to £29,879; leaving a balance of £7276 as profit on the year's working. The amount of undivided profit from last year was £839; thus increasing the balance for the year to £8115. This amount the Directors propose to deal with as follows: Interim dividend to June 30 of 2½ per cent. on consolidated and new ordinary stock, £3219; second half-year's dividend to Dec. 31 at the rate of 5 per cent. per annum £3218; to be carried to the reserve fund, £500; and to the plant renewal fund, £200—leaving a balance of £978 in addition to the reserve fund of £7000. The increased consumption of gas was 14,850,000 cubic feet, equal to 6·11 per cent. The total of ordinary meters in use on Dec. 31, 1898, was 5300; the increase being 180, or equal to 3·51 per cent. The number of gas cooking-stoves in use on rental at the close of the year was 660; being an increase of 112, or equal to 20·4 per cent. The Company have adopted penny-in-the-slot meters, and fixed 379 during the past year. So far, the experiment had proved a success. The working statements on the accounts show that, under the supervision of Mr. W. Hardie, jun., 27,066 tons of coal and cannel were carbonized last year; the make of gas being 286,024,000 cubic feet, of which 262,061,000 cubic feet were accounted for. The residuals produced were: 16,239 tons 12 cwt. of coke, 283,169 gallons of tar, and 234 tons 5 cwt. of sulphate of ammonia. New meter-stores and workshops were opened last year; and the Directors contemplate further enlargements of the works.

The ordinary general meeting of the Winchester Water and Gas Company was held a few days ago, under the presidency of Mr. Barrow Simonds. The half-yearly report submitted to the meeting showed that the receipts on revenue account amounted to £10,977, and the expenditure to £6961—leaving £4016 to be carried to the profit and loss account; making the balance of this account £6500. The Directors recommended dividends for the half year at the rates of 10 and 7 per cent. per annum on the original and new capital respectively. The Chairman, in moving the adoption of the report, referred to the serious illness of their Manager (Mr. F. G. Dexter), which, he said, was regretted by all. He was, however, much better; and it was now hoped he would recover. The accounts, on the whole, were very satisfactory. There was an increase of £104 from sales of gas, and the rental of meters showed a slight rise. There had been £40 more received for gas-stoves, and about £107 additional water-rental. With regard to residuals, coke had decreased by £184; but breeze had slightly improved. Referring to water gas, he said many people were frightened at the reports spread about in regard to this commodity, it having been alleged that it was more dangerous than coal gas, if allowed to escape. Carburetted water gas contained a much larger quantity of carbonic oxide than coal gas, but for many purposes it was much better than that gas. The report was unanimously adopted.

THE PROPOSED ENLARGEMENT AND EXTENSION OF MAINS OF THE LEEDS CORPORATION GAS DEPARTMENT.

In the article on "City Improvements in Leeds" which appeared in the last number of the "JOURNAL," reference was made to an important scheme which the Gas Department of the Leeds Corporation have had under consideration for enlarging and extending the distributing plant to meet the requirements of the city. The work will be spread over five years, and cost close upon £112,000. The scheme, which is based upon a report prepared by the General Manager (Mr. R. H. Townsley) and the Superintendent of the Mains Department (Mr. Walter Hole), was adopted by the Mains Sub-Committee last Wednesday; and their decision now only awaits confirmation by the General Committee. Taking first the service mains, which include all those of 8 inches diameter and under, it has been estimated that the annual capital expenditure thereon may be put at £11,324. The extensions in this department, therefore, with an incremental increase of 5 per cent. per annum during the next five years, will cost £65,696. With regard to the trunk mains, their enlargement in accordance with the scheme will involve an expenditure of £13,093, or allowing £1309 for contingencies, £14,402. The extensions of these mains will cost £22,739; making with the £65,696 for service mains a total of £88,435. Allowing £8843 for contingencies, a total of £97,278 is arrived at, which with the £14,402 above mentioned added is brought up to £111,680. The most important item in the list of enlargements is the length of 870 yards of 36-inch main to replace the 20-inch main extending from the New Wortley works to West Street (including provision for a 36-inch steel main and two bridges in Wellington Road), the cost of which is put down at £3553. This will increase the trunk supply to the centre of the city from these works. A further enlargement from St. Philip Street to East Parade—830 yards of 30-inch main to replace 20-inch—will cost £2611. It is proposed to lay an independent main 18 inches in diameter and 3700 yards long from the above-named works to Sheepscar, to supply the gasholder station there simultaneously from those works and from Meadow Lane. This portion of the scheme will involve an expenditure of £5808. An important extension, to cost £2465, is 1462 yards of 20-inch main to supply the town part of the Hunslet district; and another, to cost £2090, is a length of 950 yards of 24-inch main to increase the trunk supply to the whole of the Roundhay Road district. The extensions of trunk mains will comprise 1310 yards of 10-inch, 2430 yards of 12-inch, 1160 yards of 14-inch, 5635 yards of 18-inch, 2652 yards of 20-inch, and 2720 yards of 24-inch; making a total of 15,907 yards. If this important scheme is carried out in its entirety, it is believed that the distribution of gas throughout the city will be accomplished more satisfactorily than it has been for many years; that there will be a large increase in the sale of gas and a decrease in the leakage; and that the result will be an absence in a great measure of the serious inconvenience which many of the consumers have had to suffer owing to the inadequate supply of gas. In connection with the main-laying operations, arrangements will be made to govern the high-lying districts separately from the lower ones.

THE DISPOSAL OF GAS PROFITS AT WEST BROMWICH.

In the last number of the "JOURNAL," it was reported that £2000 would in all probability be handed over by the Gas Committee of the West Bromwich Corporation in aid of the general district rate; being £500 more than they had been able to give for the past ten years. The announcement of this fact at the last meeting of the Town Council drew some remarks from a member (Mr. W. H. Keys) on the question of the disposal of the gas profits. He said there was a promise last year of a material reduction in the price of gas; but it had not been reduced in anything like the proportion it should have been. It was wrong in principle and not sound financing to run the gas-works to make a profit, and hand over a large sum for the good of non-consumers. He referred more particularly to the great Railway Companies, who would benefit largely by the course proposed. Mr. Chesshire supported the views expressed by Mr. Keys. He said he considered it was a great mistake not to reduce the price of gas; for the lower it was, the greater would be the consumption. This allocation of profits in relief of the rates did a great injury by covering up the sins of the Council. Mr. Bushell said he had called attention to this point on more than one occasion; but he had grown tired of trying to get a true system of economy established. With regard to the present method, it was rotten to the core. It was "robbing Peter to pay Paul." They used the gas profits for levelling up deficiencies which it would be inconvenient to bring before the public. He hoped the time would come when a more enlightened policy would be pursued, and when the money would be applied, first of all, in reducing the capital account of the Corporation, and bringing it to within reasonable limits. Alderman Blades concurred in the remarks of previous speakers, and added that there was a belief that the Highway Committee were paying about £1000 per annum more

than they ought to do for the public lighting. If this was so, the Railway Companies were having the benefit of a large share of the £1000. It was wrong for the Committee to take credit for making a large profit when they did it by overcharging another department of the Corporation. Mr. Lawly said his impression was that the price of gas had been reduced as low as it could be with safety. By excellent management, and through the energy of the Committee, they had made this profit, which they did not anticipate; and now the Council did not wish to take it. He considered the Committee were pursuing a sound policy. Mr. Wilson did not think the town had much to complain of. The Committee charged 1d. per 1000 cubic feet more than the Birmingham Corporation; but they made concessions in respect of gas used for motive power such as were not granted in the city, and this could not fail to help manufacturers. But for the increase arising from the prepayment meters, they would not have had this large profit. They had to face a prospective increase in the price of coal; and the Council must not therefore expect the same profit next year. He did not believe the Birmingham Corporation obtained a heavy profit for the gas they supplied for public lighting in the surrounding districts; but they did get some profit on what they supplied to private consumers. The discussion then turned on the price charged for the public lamps in West Bromwich and Birmingham; and in the end, the report of the Gas Committee, which gave rise to Mr. Keys' remarks, was adopted.

OLDBURY GAS SUPPLY.

The Annual Report and Accounts of the Gas Department.

The annual report and the statement of accounts in connection with the Gas Department of the Oldbury District Council for the year ended Dec. 31, 1898, issued by the General Manager (Mr. A. Cooke), were submitted at the last meeting of the Council. The total amount borrowed up to the end of the year was £79,199; and of this £15,136 had been repaid; leaving the outstanding loans at £64,063. During the year, £165 was expended on new buildings and manufacturing plant, and £360 on new meters, mains, and service-pipes; making the aggregate outlay £525. This brought the total expenditure on the undertaking to Dec. 31 up to £79,772. The manufacture of the gas cost £7443; distribution, £687; lighting and repairing public lamps, £387; rates and taxes, £779; and management, £324—the total expenditure being £9620. The sales of gas, including that supplied for public lighting and under contracts, brought in £11,820, and the residual products £2915; while the profits on the gas-fittings amounted to £209, and the discounts on purchases to £61—making the total income £15,005. The gross profit was therefore £5385, against £5294 last year. After deducting the usual payments for interest, &c., there remained a balance of £2033 as the net profit for the year, as compared with £1860 in the previous year. The Gas Committee recommended that £600 out of the profits should be used in relief of the general district rates. Mr. Thomlinson, in moving the adoption of the report, said the past year had been a very prosperous one, as there had been a substantial increase in the consumption of gas as compared with 1897; the receipts from the sale of gas showing an increase of £473. The amount contributed towards the relief of rates had been increased from £400 in 1897 to £600. It was mentioned that the Gas Committee proposed to hand over the latter amount at once; consequently it would come into the present year's accounts. The report was adopted.

GAS AND WATER DEVELOPMENTS AT CHESTERFIELD.

Local Government Board Inquiry.

On behalf of the Local Government Board, Mr. H. P. Boulnois last Wednesday held an inquiry at Chesterfield respecting an application by the Gas and Water Board for sanction to borrow £10,000 for the purposes of their undertaking. Mr. John Middleton, Clerk to the Board, said the application was for permission to borrow money to repay what had been expended on capital account out of revenue, owing to the largely increased demand for gas and water. Taking the sums already expended up to March 31, 1898, amounting to £2123 in respect of gas, and £461 in respect of water, and estimating their requirements during 1899 and 1900, they found that the £10,000 which they were now applying for power to borrow would be expended in the proportion of £8500 on gas extensions, and £1500 on water extensions. The Board were empowered to raise £30,000 in respect of gas, and £15,000 in respect of water. For gas purposes they had already received the sanction of the Local Government Board to £16,744; but they had not borrowed any money whatever for water purposes. The Inspector remarked upon the development which had taken place in the gas-stove and prepayment meter parts of the Board's business. Mr. Middleton stated that they were doing well in these directions. They had already fixed 800 slot meters out of 850 applications. The charge for gas for illuminating purposes was 3s. 6d. per 1000 cubic feet, for engines 2s. 6d., and for public lighting 3s. Substantial discounts were given where the quantity of gas consumed was heavy; and the ordinary consumers' payments were subject to 10 per cent. The statutory illuminating power was 15 candles; but the gas supplied was of 17 to 18 candle power. Since the Board took over the concern from the old Company three years ago, they had more than doubled the number of customers. In 1897 they added 332 to the list, in 1898 there was a further increase of 517, and up to the end of February of the present year the number had been further augmented by 402. When the concern was taken over, the annual output of gas was 56,887,300 cubic feet. This quantity had since been increased to the extent of 26,112,700 cubic feet—or nearly 50 per cent. in the three years. The price of gas had also been reduced. The number of water consumers had advanced to 1133—equivalent to 12·25 per cent. increase. At the close of the inquiry, the Inspector visited the works.

Explosion of Acetylene.—In one of the rooms of the Blue Bell Hotel, Shaw, near Oldham, acetylene has lately been used as the illuminant. A Mr. Lord, who resides at the hotel, was charging a cylinder on the night of the 26th ult., when a violent explosion took place, which shook the building and severely burnt him.

STREET LIGHTING AT PLYMOUTH.

Incandescent Gas-Lighting v. Electricity.

At the invitation of the Directors of the Plymouth and Stonehouse Gas Company, a number of representatives of various local bodies attended at the offices of the Company last Tuesday night to witness a demonstration of the advantages of incandescent gas lighting for street illumination. For about a week previous there had been in use outside the offices of the Company two of the Welsbach Company's ornamental "Eclipse" lamps, with two No. 4 anti-vibratory burners, of 100-candle power each, in each lamp. So far as the light was concerned, it was obviously everything that could be desired. The attention of the visitors—who included representatives of the Corporation of Plymouth, the Chamber of Commerce, the Mercantile Association, the Western District Ratepayers' Association, and the East Stonehouse District Council—was directed to its economic advantages.

The Deputy-Chairman of the Gas Company (Mr. J. A. Bellamy) delivered a short address, in the course of which he described the present lighting of Plymouth as disgraceful, considering the low price of gas in the town. No doubt both the Corporation and the Company were to blame; but both bodies had determined to "turn over a new leaf." From the 31st of March, the Corporation would undertake the lighting of the town on their own account; being treated by the Company in the same manner as an ordinary customer, except that they would be allowed a discount of 5 per cent., which would make the charge 1s. 8d. per 1000 cubic feet. The Company would work loyally with the Corporation to see how far an improvement in the lighting of the town could be brought about. Certain streets were to be lit by electricity; and it was more than probable that other streets would be lit by the new Welsbach burner, specimens of which had been put up experimentally. From investigations made on behalf of the Company, they were satisfied that the lighting of the whole of Plymouth could be done on this principle at less cost and much more efficiently than with the present old burners. It was essential, in order to make the town attractive to visitors and for the purposes of trade, that its main thoroughfares should be brightly illuminated; and if good lighting was introduced into the poorer quarters, it would be a blessing to the inhabitants. Probably the revenue of the Company would not increase by the adoption of these burners; but they would have the satisfaction of knowing that they had contributed to supplying a long-needed want. The consumption of gas by the four burners of 100-candle power each had been as follows: March 4, 130 cubic feet; March 5, 127 cubic feet; March 6, 124 cubic feet; and March 7, 126 cubic feet. On each day the burners were alight for 6½ hours. The consumption named included the bye-pass, and it gave an average of 19½ cubic feet per hour, or rather less than 5 cubic feet per hour for each burner. Upon a basis of 4000 lighting hours per annum, the cost, with gas at 1s. 8d. per 1000 cubic feet, was £1 13s. 3d. An incandescent electric lamp of 100-candle power would cost for the same period, at 4d. per unit, £24; at 3d., £18; at 2d., £12; at 1d., £6. If instead of the incandescent electric lamp the electric arc lamp were adopted, the cost would be reduced; but in other towns it had been found that arc lamps of great power placed far apart were unsatisfactory, and inferior in every way to incandescent electric lamps of less candle power. In any case, with gas at 1s. 8d. per 1000 cubic feet, the cost of an electric light of the same candle power must be higher many times over than the Welsbach incandescent gas-light. The ordinary street-lamp in Plymouth consumed 4 cubic feet of gas per hour, and gave a light of about 12 or 13 candle power. For the same consumption with the incandescent burner they got eight times the illuminating power.

The visitors had an opportunity of seeing the actual consumption of gas during the time they were at the offices of the Company. The meter register was taken on their arrival, and at the end of half an hour it showed that 9½ cubic feet had been consumed. In addition to the Deputy-Chairman, there were present at the demonstration other members of the Board, and Messrs. J. Thomas (Secretary), A. Wharton (Engineer), P. S. Hoyte (Assistant-Engineer), and H. R. Coles (Superintendent of the Distribution Department).

THE FALMOUTH GAS AND WATER PURCHASE SCHEME.

The Bill of Costs.

Another acrimonious discussion took place at the meeting of the Falmouth Town Council last Saturday week, respecting the costs of the recent unsuccessful scheme for municipalizing the gas and water-works. Bills had been sent in to the amount of £486; but the Finance Committee reported that various reductions had been effected.

Mr. F. J. Bowles presented the report of the Finance Committee, but said he differed from the Committee in reference to the amount expended upon canvassing. The Committee decided not to ask for particulars of this account; but he thought they were entitled to know who the canvassers were, and what was paid to them. He read a letter from Mr. Silverthorne, who acted as Consulting Engineer to the Corporation in the promotion of the scheme. Mr. Silverthorne expressed regret at the failure of the scheme through the robust opposition by which it was confronted, and said that on this account he was willing to write £22 off his account. The Gas and Water Committee recommended that the full amount be paid; but the Finance Committee thought it more reasonable to accept Mr. Silverthorne's offer.

Mr. W. W. Phillips characterized the expenditure as a wilful waste of money. If those who were responsible for it had to pay the money out of their own pockets, they would not have been so reckless. If a Government Auditor went through the borough accounts, these gentlemen would be taught a lesson.

It was decided to pay Mr. Silverthorne's bill with the reduction to which he consented. A number of accounts for printing were then presented.

Mr. Phillips asked who authorized this expenditure.

Mr. Bowles said the bills included advertising as well as printing charges. Personally he objected strongly to the expenditure of some members of the Committee in issuing irrelevant and inaccurate circulars; but the expense had been incurred, and the printers must be paid. He had his

own opinion as to the wisdom of the Chairman of the Gas and Water Committee, and even of the Mayor and others, who had distributed these circulars.

The Mayor: What I did was done by resolution of the Gas and Water Committee.

Mr. W. Banks said that if the circulars were authorized by the Committee they must be paid for, as the Corporation gave power to the Committee to spend money.

Mr. Bowles said he believed some of the bills were ordered by individual members of the Committee.

These accounts were passed with certain reductions which had been arranged.

A discussion then ensued as to Mr. R. H. Harland's account for analyzing sixteen samples of water. The Finance Committee recommended that Mr. Harland be asked to forego his charge for seven of the samples which were delayed in transmission, with the result that the analyses were of no use.

Mr. Bowles said these samples did not reach the analyst for several weeks after they were despatched; and the long delay prejudiced, if it did not altogether destroy, the value of the analyses.

Mr. W. J. Coombes moved that the account be paid in full, and said he had never heard of a more absurd or stupid request being made to any professional man. The analyst did the work, and must be paid.

Mr. W. Banks pointed out that the Committee employed a different analyst on this occasion from the gentlemen who had previously analyzed samples of the water. Their action, he said, was open to the representation that the change was made in the hope of getting a less favourable report, so as to serve their purpose as against the Water Company.

The Committee's recommendation as to this account was adopted.

With reference to the account for canvassing, which amounted to £33,

Mr. Bowles said it was understood that the canvassers were employed by a majority of the Committee to go round the town and induce people to vote. He did not think that was a right thing for the Corporation to do. It was a serious evil for the money of the ratepayers to be used in this manner; and the evil was intensified when it was done by a sort of secret service fund, as to the allocation of which they had no information before them.

The Mayor said the Committee left it in his hands, in conjunction with the Town Clerk and the Chairman of the Gas and Water Committee, to employ canvassers and make arrangements. He could scarcely tell who was employed; but when it came to settling up, he found that sufficient money had not been allowed, and he was out of pocket over it.

Dr. Harris thought they ought to take it for granted. The Mayor was requested to do his best to get the matter settled; and he thought it necessary to employ certain men and pay them. The Corporation should reimburse the Mayor without expecting him to give details.

Mr. Phillips was in favour of paying the money, but thought they should have particulars.

It was decided, by 7 votes to 5, to pay the money without asking for any particulars.

The Town Clerk's bill amounted to £160 17s. 9d.; but as Mr. Silverthorne and the printers had consented to a reduction, and the scheme was unsuccessful, he expressed his willingness to accept £150.

Mr. Bowles said he felt very strongly that the Town Clerk's bill would have been less by one-half if various members of the Gas and Water Committee had not continually sought his services, and called upon him to deal with a large number of matters which were entirely irrelevant.

Mr. Grose considered the Gas and Water Companies had spent a great deal more in opposing than the Corporation had spent in promoting the scheme.

A heated discussion followed, in which Mr. Grose asserted that the Town Clerk did his best to frustrate the scheme; but in the end the bill was passed by a majority. The other accounts were then allowed without comment.

AN ENTERPRISING PROVINCIAL GAS COMPANY.

By an Occasional Correspondent.

It is not too much to say that at the present time there is a keen contest between the purveyors of gas and electric light as the illuminant for the interestingly ancient, but very progressive, capital town of Wiltshire—Salisbury. To say also that gas is well holding its own is to keep closely to the facts. It was with feelings and thoughts something akin to those just expressed that I found my attention suddenly arrested not many nights ago, while walking along The Canal (as one of the chief thoroughfares of the city is named), by the appearance of a brilliantly lighted establishment at a spot where darkness had hitherto reigned supreme. The thirst for journalistic information came suddenly and strongly upon me; and I proceeded to bestow on it the best treatment for all thirsts—I endeavoured to assuage it. On entering the premises, which were the new offices and show-rooms of the Salisbury Gas Company, I attracted the attention of an obliging assistant, who showed me a large selection of the latest novelties in gas stoves and burners, samples of the various residual products, and a commodious workshop in the basement; the whole appearing to be admirably adapted to the outdoor operations of the Company. The thirst for things informative was, however, only partially satisfied, as was evidenced by my wishing to know all that was to be learnt as to the reasons which had led to this important addition to the commercial enterprises of the city. The courteous assistant was of opinion that his visitor should see Mr. Norton H. Humphrys, the Company's Engineer and Manager, at the gas-works. The visitor shared this view; and a few minutes later he was to be found trudging to a suburban portion of Salisbury, not far from the Railway Stations. Had he been in any doubt as to the locality, the huge gasholders which are conspicuous features from all the high-lying parts of the city and the surrounding country would soon have made him sure of the track to his destination. Those who only look upon this particular district as a scene of Old World repose, would have been surprised at the signs of activity encountered on entering the immediate locality of the works. Waggons laden with coal were passing into the works, and others laden with coke and residual products were going out. From not far off came a sound that is musical to those of us who are interested in hives of industry—the clanging of the anvils in a blacksmith's forge. Men clad in raiment more suited to the land of the Khalifa than to an English town in winter were moving briskly about, dragging iron barrows filled with red-hot coke, from which arose clouds of fumy steam. All seemed to be busy. Some were loading coals into barrows; and others, by the aid of steam-driven machinery, were sorting coke into various sizes, to meet different domestic and commercial requirements.

Having managed to pick my way without accident among the men, and the carts, and the steaming coke-barrows, I at length found myself in the presence of Mr. Humphrys, who kindly consented to be worried for a time by the bombardment of questions in store for him. Among other things he told his interrogator was that for some years the Company's business had been extending on the eastern side of the city. But many of the customers objected to the distance the works were from the centre of the city, and having to make their way through the maze of men and carts, and so forth, in order to get to the offices; and so the opening of the fine premises on The Canal was decided upon. Within the last few years the public have shown an increasing interest in regard to the best methods of using gas; and they have recognized that its value as an illuminant is greatly affected by the degree of care and intelligence applied in its consumption. This has been especially the case since the streets have been lighted by Welsbach burners; and there is no doubt that this excellent medium of illumination is now most highly appreciated.

The Directors have always been on the alert to meet the wishes of their customers; and to the Company belongs the honour of being among the first to introduce the now largely-adopted system of letting gas-stoves on hire. It was with the same desire to meet a generally expressed want that they decided on substituting the Welsbach for the ordinary flat-flame gas-burner. But it is especially in regard to public lighting that the Company have shown themselves enterprising and up-to-date. In November, 1897, the then Mayor (Mr. Howard Harris), in a speech to the Town Council, pointed out the necessity for the better lighting of the city; and, acting on some hints this gentleman threw out, Mr. Humphrys proceeded to make certain experiments on the public lamps, which worked satisfactorily. Later on the Company tendered to light the whole district under the control of the Council by means of the improved Welsbach system, which was only introduced last June. Here it should be pointed out that the tender has been the subject of some misunderstanding—not to say misrepresentation; it being stated by some people as being 40 per cent. below the rates previously charged. The real fact seems to be that the new burners consume about one-fourth of the gas supplied under the previous contract, and that the Company had no choice, being compelled by the terms of their Act of Parliament to give to the city the benefit of the economy thus available. To use a well-known adage, "The proof of the pudding is in the eating;" and the new system of lighting in the city has been long enough in use to enable the inhabitants to realize the vast improvement that has been effected, and to make them feel grateful that the management of the gas-works of their city is such as to enable the Company to "rise to the occasion."

Your correspondent was exceedingly interested in all he heard; but he could not forbear asking Mr. Humphrys whether he did not think it was a bold stroke for the Company to go in for a large increase of their expenses at a time when there were rumours that there would be a curtailment in the demand for gas in the future.

"Our experience," replied Mr. Humphrys, "is all the other way. I have known the Salisbury Company's business intimately for fifteen years, and never has it been more active, nor have inquiries from prospective customers been more numerous. Our energies are taxed to the utmost to meet the needs of to-day, and we have no time for idle speculations as to the possibilities of the future. My own opinion is that the gas industry was never in a sounder or more satisfactory position than it is now. But if such a contingency as you suggest should happen, do not suppose that the consequences would be limited to our stockholders. We pay 25 per cent. of our profits to the rate collectors; and a similar proportion of our gross receipts passes through the pay office on Saturday nights, and is immediately circulated in the city. That we acknowledge to be something to think over."

"You will excuse me for putting a plain question; but what do you say to the fact that people are always crying out for a reduction in the price of gas supplied?"

"I have no objection to your plain question, and I will give you a plain answer," said Mr. Humphrys. "Our policy has always been to sell at the lowest possible price. The Directors have repeatedly made reductions in the past, without the slightest pressure from outside; and they will no doubt continue to do so as opportunity arises."

My battery of queries having become exhausted for the time, I accepted Mr. Humphry's invitation to take "a run round the works," and spent some interesting time in an examination of the various processes of gas manufacture and purification. I also inspected the sulphate of ammonia plant and visited the laboratory. What I saw sufficed to convince me that in the Salisbury Gas-Works was to be found an important and thriving local industry; and in their Manager, "the right man in the right place."

Buckets v. Hose Pipes for Quenching Coke.—An inquiry was held last Tuesday, before Mr. J. E. Hill, the Deputy-Coroner, into the circumstances attending the death of Charles William Fielding, aged 68, who was fatally injured at the Sowerby Bridge Gas-Works, where he was employed as a labourer in the winter, on the previous Saturday. Walter Holmes, who was working with Fielding on the night shift at the time of the accident, said that deceased was throwing a bucket of water on the hot coke when witness heard the pail fall, and on looking round he saw Fielding lying on the ground with his head against the wall. Dr. Paton was called in, and ordered the deceased home. John Lawton, the foreman at the works, was questioned by Mr. J. C. Bell, who appeared for the deceased's family, as to why buckets were used instead of a hose-pipe for quenching the coke. He said that buckets had been in use at the gas-works for 23 years. Mr. John Marsland, the Manager, stated that if the hose-pipe system were introduced it would mean an additional outlay of £200 a year. A verdict of "Died from injuries to the head caused by an accidental fall while at work" was returned. The Deputy-Coroner remarked that, even if a fit were the cause, the fall would be an accident.

ELECTRIC LIGHTING NOTES.

There is little probability now—if indeed there ever was—of the Devonport Corporation adopting the advice that they should buy electric current in bulk from the Plymouth Corporation. The difficulties of finding a site for a generating station are as great as ever; but Devonport seems more disposed to face them than to risk partnership with the neighbouring borough. At all events, it was decided last Thursday to appoint a Resident Electrical Engineer, whose duty it was explained would be to design the scheme, and cultivate a market for the use of the current in the town.

Although the space at the present generating station of the Exeter Corporation electric lighting works is almost completely covered by machinery, it is necessary to make some extensions. On the advice of their Engineer, the Electric Lighting Committee has decided to put down an additional boiler of 500-horse power and an alternator of 250-kilowatt capacity. These additions will cost £5350; and a loan is to be obtained for their purchase. It is expected that these extensions will enable the Committee to tide over next winter. After that it will probably be necessary to remove the works to another and larger site.

The foundation-stone in connection with the new electricity works which are in course of erection by the Corporation of Barnsley was laid last Thursday by Mr. W. Brady, the Chairman of the Park and Lighting Committee, in the presence of a large number of the members of the Council and public. The new buildings are between the Barnsley Gas-Works and the sidings of the Great Central Railway. The contracts for the erection of the buildings amount to £3080, and those for the plant to £18,931. Mr. Brady, in laying the stone, said he thought the erection of the works marked a new era in their municipal undertakings; and he believed they would be a success. He thought they would not injure the Gas Company.

The statement of accounts for last year's working of the Electricity Department of the Worcester Corporation were laid before the Council on Tuesday. The capital account showed a total expenditure of £74,397. On the revenue account, the gross receipts were £7154, as compared with £6291 in 1897; and the expenditure £3943, against £4096 in 1897. There was a gross profit on the working of £3210, as compared with £2195 in the previous year. After payment of interest and sinking-fund charges, there was a net deficit of £460, as compared with £1474 in 1897. The Engineer (Mr. Sutherland) was of opinion that if the new plant had been completed before the end of the year, and if the coal strike had not added to the cost of fuel, there would have been a profit instead of a loss.

The Leeds City Council last Friday adopted minutes of the Lighting Committee, who recommended, among other matters, the borrowing of £150,000 for electricity purposes. In speaking upon the Committee's proposals, Alderman Wigram stated that, since the Corporation had taken over the electric lighting installation they had expended considerable sums of money. The position which the Council had taken was to endeavour to complete the existing station on the lines originally laid out. This necessitated an expenditure on the station of £33,500; on additional mains, sub-stations, and distribution, £46,000; and to provide for capital expenditure to Feb. 25, £12,500—making a total of £92,000. The increase in the output for this outlay was in the proportion of 7 to 4; and this increase, judging by the past rate of demand, was estimated to last to December, 1900. For the proposed Britannia Mills Station they provided for buildings £25,000. and for mains and machinery £33,000.

The subject of municipal enterprise is very much to the front just now; and the remarks made by the Attorney-General at the Society of Arts on the occasion of the reading of Mr. Dixon H. Davies's paper a few weeks ago have given rise to correspondence in various local papers, especially those published in towns where the desire for municipalization possessed by a certain section of the community is checked by the actions of the less ardent spirits. Sir Richard Webster, it may be remembered, said he thought that, "whatever might be said of the profits made out of municipal enterprises, it would be found that the rates were to the ordinary ratepayer less burdensome where no trade risks were undertaken. One half of the total of local debt was roughly believed to be due to trade risks." A writer in a Hastings paper remarks that anyone who desires to confirm what Sir Richard Webster stated can readily do so; and he, too, thinks it will be found that, as a rule, the rates are higher in towns where the Corporation own gas, electric, and tramway undertakings than in those where the ratepayers' money is not speculated with in such concerns. He goes on to say: "In our own case, it is surely a most extraordinary thing that two or three members of the Corporation, possessed of no proper knowledge or experience in reference to the question, should, perhaps prompted or assisted by the permanent officials, be able to oblige the proprietors of the Electric Light Company, and relieve them of their responsibilities, at the cost of the ratepayers. For this is what it amounts to. Professor Robinson reported that the Company would have to considerably reduce their capital account to be at all successful in future; and this has been abundantly confirmed by subsequent events. Yet, in spite of this, the Corporation have been allowed to pay the Company £62,095 for their concern, being £4095 beyond the £58,000 applied for. The interest and sinking fund on this sum is over £4000 per annum; and it is more and more improbable the Corporation can make both ends meet, let alone produce a profit. Not content with the above perilous condition of affairs, the Corporation, practically without discussion, have further authorized an expenditure (some at once, some gradual) of £32,768. This will mean a total of £94,863 for a 775-kilowatt plant, and does not include the cost of the public electric light works. A redeeming feature of the question is the determination of the Corporation to work the electric light department separately; but the Sub-Committee of Management have, of course, no direct pecuniary responsibility. This is very evident, seeing that an extension of electric mains to a district has been granted which it seems almost certain, from the fact of many of the chief proprietors of the Electric Light Company residing there, would have been made years ago if it had been worth doing—*i.e.*, profitable. The loss, however, of such speculation now falls on ratepayers, not on the shareholders of the Company." The writer thinks the local ratepayers do not realize the fact that in the immediate future the acquisition of the electric light works will far more likely prove a burden rather than any assistance to the already considerable rates.

CLACTON-ON-SEA GAS AND WATER ARBITRATION.

Monday, March 6.

(*Before* Mr. G. H. Hill, *Umpire.*)

The arbitration to fix the purchase price to be paid for the undertaking of the Clacton Gas and Water Company by the Clacton-on-Sea Urban District Council, was continued to-day at the Westminster Palace Hotel. The previous proceedings, dealing with the gas portion of the undertaking, were reported last week (p. 597).* Mr. Charles Hawksley was Arbitrator for the Council; and Mr. Corbet Woodall for the Company.

Mr. Balfour Browne, Q.C., and Mr. Fleetwood Pritchard appeared for the Company; Mr. C. A. Cripps, Q.C., M.P., and Mr. Freere represented the Council.

Mr. Balfour Browne, in briefly opening the water portion of the case for the Company, said the water undertaking consisted of certain wells, which had not always had good luck. At one time, from being sunk too deep and being near the sea, they suffered from the percolation of sea water. Later on, however, very large deposits of water were found in the gravel beds; and from these in most cases the Company had obtained a supply of excellent quality. Counsel then dealt in detail with the various works, some of which he said had been abandoned; while one freehold pumping site, though yielding excellent water, was near the centre of population, and therefore would be more valuable as building land. If the Company had continued in possession, this station (which was worth some £4000 or £5000) would have been sold. The two sites from which pumping was carried on were unfortunately not freehold; and therefore it was proposed in the valuations to be submitted to hand over these leasehold sites to the Local Authority as a damaged asset, allowing such a sum as would be sufficient to turn them into freehold assets and enable the Local Authority to establish themselves in them in perpetuity. From the present maintainable revenue, a deduction was allowed for the reservation of land provided for protecting the present adit and pumping station and for meeting future requirements. At the two wells still open at Watson's Land and Scragg's Land, enough water was obtainable to maintain the present revenue. Nothing was claimed for prospective value, because if the town grew rapidly the Company would necessarily have to go further afield for fresh sources. As a matter of fact, power to do this was obtained in the Act of last session; but inasmuch as the agreement with the Local Authority scheduled to the Bill provided that the 1885 Order should remain unaffected for the purposes of arbitration, prospective value for the new works sanctioned could not be claimed. Counsel then dealt briefly with the statistical tables compiled by Messrs. Alfred Lass, Wood, and Co., which showed that while the original 10 per cent. capital of £10,000 had been issued and paid up, £2500 of the £10,000 7 per cent. additional capital remained unissued. It appeared that at the end of 1898 an amount of £4088 was overdrawn on capital account. Wherever this money came from, it would have to be paid out of any sum allowed by the arbitration. The amount expended on capital account up to 1898 was £26,588. Turning to the statement showing the water-rental for each of the twelve years ended Sept. 30, from 1887 to 1898, Counsel pointed out the water-rental for the last-mentioned year, after making deductions for allowances, discounts, bad debts, and empties, was £2508. This was the initial figure taken in the calculations to be submitted by the experts. But inasmuch as the undertaking was to be taken over at its value "on the appointed day" of transfer, which he assumed would probably be the 23rd of June next, it was proposed to add to the £2508 an amount representing nine months' increase before the date of the accounts and the day of transfer. In each of a long series of years there had been an increase. The increase in the last ten years amounted to 13·64 per cent. per annum. A calculation on this basis for nine months gave £256 as the sum to be added, making a total of £2764. Taking working expenses at 45 per cent., which worked out at £1244, left the maintainable income at £1520. Deducting £200 for mortgage interest, there remained £1320 as the sum to be capitalized. Counsel claimed that this amount was worth 33⅓ years' purchase, or £44,000 as the total gross sum, which, after certain deductions, left £24,266 as the net value of the water undertaking. In addition to this, something was claimed for the freehold land of about 2 acres at the Signal Box pumping-station, which had been valued at £4515; and a small sum for a piece of land bought for a proposed reservoir site.

Mr. *E. W. Drew*, of Messrs. Alfred Lass, Wood, and Co., examined as to the tables put in, bore out the opening statement of Counsel, and said the water-rental during the twelve years ended 1898, showed a continuous increase; being £2508 in that year, as compared with £2352 in 1897, though after September, 1897, the Urban District Council had used sea water for flushing and road watering. The maintenance charges in 1895 and 1898 were much above the average. The average annual rate of increase in the net water-rental for the ten years 1888 to 1898 was 13·64 per cent.; while for the five years 1893 to 1898 it was 13·56 per cent.

In cross-examination, witness admitted that if the maximum dividends were earned by the gas undertaking in 1897, the proportion earned by the water-works would be comparatively small. The percentage of expenses to total income in 1895 was 69·87, in 1896 60·79, in 1897 54·50, and in 1898 65·87. Compared with the annual average rate of increase in the net water-rental for the ten years above mentioned, the percentage of increase for 1898 over 1897 was only 6·6.

Dr. *Sims Woodhead*, examined as to the quality of the supply, said he had taken samples and subjected them to all the tests with which he was acquainted. He came to the conclusion that it was an exceedingly good water.

Mr. *G. R. Strachan* gave details of the various works and wells laid down by the Company during, and submitted a valuation taking the net water-rental to Sept. 30, 1898 (as per Messrs. Alfred Lass, Wood, & Co.'s table), at £2508. To this sum he added £256 as nine months' increase taken on the basis of 13·6 per cent. per annum; leaving as the estimated water-rental at June 23, 1897, £2764. Working expenses, taken at 45 per

* In our report last week (p. 597, second paragraph), Mr. Valon was made to say that the Morley arbitration was 40 years' purchase. What he said was the award in the Morley case was more than 30 years' purchase.

cent., accounted for £1244, and left as the maintainable income £1520, or, less £200 the interest on mortgage, a sum of £1320 as the annual profit, which, capitalized on the 3 per cent. table, brought out a gross sum of £44,000. From this amount certain deductions were made on account of two reservations of land (35 acres each), duplicate pumping plants and building for each reservation, well and collecting pipes, filters at old works, water-tank to hold 50,000 gallons, works to pump filtered water into lower tank, and capitalized value of working expenses at filter-beds, amounting to £19,734, and leaving as the value of the undertaking £24,266. The maximum daily consumption in 1897 was 132,691 gallons; and, by deduction, he estimated that 162,000 gallons would be a sufficient supply in June next. The estimated supply from the new works would be 217,000 gallons per day.

In cross-examination, witness said there were no parliamentary powers in connection with the two reservations of 35 acres of land; but he thought they could be bought at the price stated. Though he was not prepared to say Watson's Land was unsatisfactory, he would prefer going further afield. He believed the permanent population was between 5000 and 6000; and in his opinion 25 gallons per head per day on the resident population would be amply sufficient for both them and the visitors.

Mr. *Henry Rofe* put in a valuation of the Company's undertaking based on the assumption of a perfect or ideal water company. It differed from that of the previous witness in taking the working expenses at 50 per cent.; but it was pointed out that in this figure filtration was included, whereas Mr. Strachan's valuation had taken filtration separately. Witness explained that on the basis of an ideal company, he had capitalized the amount of £1178 obtained after deduction of working expenses and the interest on mortgage from Messrs. Lass's figure of £2755, which, at 36·36 years' purchase, brought out an amount of £42,832. This was the sum the Company ought to receive if they possessed all the land they required freehold; and other things were in an ideal condition. There was a difference in the deductions made in the items for filter-beds and filtered water tank; Mr. Strachan allowing for 1000 square yards of filters and a capacity of 50,000 gallons for the tank, whereas witness estimated for 500 square yards of sand area, and a clear water tank to contain 100,000 gallons. His total deduction was £17,150, and the final valuation £26,067, which included 1½ per cent. allowance for costs of reinvestment. His valuation of £26,067 was equivalent to 22 years' purchase of £1178—the maintainable profit available for dividends.

Some discussion then arose between Counsel as to the principle on which the Company had excluded from the valuations, and proposed to keep themselves, the abandoned Walton Road and Vista Road sites, of which they had the freehold. Counsel for the Local Authority stated that until the scheme which they had in view was carried out, the use of the abandoned works might be temporarily necessary.

Cross-examined, witness said that in his view the size of the undertaking made no difference to the basis on which it should be valued. It did not matter whether there was a Stock Exchange quotation or not. In any well-managed country concern, he considered 56 per cent. for working expenses an exceedingly high figure. He admitted that the Local Authority would have to go to some expense in putting things on a thoroughly satisfactory basis.

Mr. *E. S. Beard*, auctioneer and surveyor, was examined as to the value of the Company's land, which he put at £150 per acre. The value of two pieces of freehold land—one at Signal Box well and the other reserved for a storage reservoir (and which items were not included in the valuations)—he estimated at £4515 and £200 respectively.

Mr. *W. Hunter*, the Manager, was briefly examined as to the quantity and quality of the supply, which he described as now satisfactory.

Tuesday, March 7.

Mr. Cripps, in continuing his opening for the Council, which he commenced on the previous day, controverted the argument of Mr. Balfour Browne that the words in the agreement providing for the transfer of the undertaking "as a going concern," excluded from the scope of the arbitration works which had been abandoned. He pointed out that the agreement provided that the undertaking should include "the several gas-works and water-works, engines, mains, pipes, machinery, plant, and works connected therewith," and concluded with the words "and all other the real and personal property and effects of the Company." He was quite willing to leave the land at the Signal Box well and the triangular piece reserved for a reservoir in the hands of the Company; but he must have the Walton Road and Vista Road pumping-stations temporarily.

Mr. Balfour Browne agreed to give the temporary use of these two works, and claimed merely the £4515 and £200 as additions to the valuations put in.

Mr. Cripps next objected to the value of the undertaking being taken as at the 23rd of June, nine months after the date of the accounts, which he said was not the interpretation of the agreement. The fixing of a day for the transfer did not mean that the undertaking was to be valued as at that date. There was no notice to treat technically in this case; but the agreement itself was equivalent to an ordinary notice to treat, and that was dated April 30, 1898. It was confirmed and made binding by the Act of Parliament on Aug. 2, 1898. If, therefore, he adopted the theory of the other side, he might go back a month or two and ask the Court to knock something off. Up to the appointed day, the Company would be free to earn and divide dividends; and after that date they would carry on the undertaking for the Council, and take 4½ per cent. on the amount awarded. With the exception of the water obtained from Watson's Land and Scragg's Land, and the small amount from the Thanet land, the Company had absolutely nothing for which they could claim a farthing as a going concern. So far as Watson's Land was concerned, the tenure was only for three years, and was merely in the nature of an easement, as was also the agreement regarding Scragg's Land. The document of title under which the Company had gone to Scragg's Land was dated eighteen days after the Act was passed, and was then only for fourteen years. The Company were not competent after the passing of the Act, and in order, as he suggested, to raise a compensation claim—for that appeared to be the true fact—to enter upon practically a new source of supply; and therefore they were clearly not entitled to compensation in respect of it. Evidence would be called to show that even Watson's Land stood condemned; and the most which the Company had got was the 17,000 gallons a day from the Thanet land. Even as regarded the existing conditions, and with the additions proposed by the Company, he contended the supply would be insufficient. The other side admitted, in substance, that while they had a market in Clacton they were not in a position to utilize it fully. He suggested that the true basis of valuation should start from the figure of £880, arrived at in Messrs. Alfred Lass, Wood, and Co.'s tables as the actual revenue up to 1898, after allowing the working expenses. It was a less accurate way to take percentages. As to the proposed addition for nine months' increase, there had been no evidence whatever that there had been a rise in the income of the Company. He had a shrewd suspicion that, if there had been, it would have been stated before the Court. As a matter of fact, the increase in the last year was only 6·6 per cent., as against the 13·6 per cent. average. If therefore anything were put on, it should at any rate be not more than 5 per cent. He, however, thought nothing should be allowed on this head. After certain adjustments had been made on the ground of the excessive cost of maintenance and repairs and water analysis in the account year, and the debenture charge had been taken into reckoning, there remained as the correct figure to be capitalized £846. He advocated 30 years' purchase as the multiplier to be applied to this sum, which gave an amount of £25,373. Very properly the other side had admitted the necessity of further expenditure to maintain the income; but to the Company's figure he suggested 10 per cent. ought to be added for contingencies—making the amount to be spent £21,707. Though the Council's scheme for the future was different from that of the Company, the variation in cost was not so great—being in the former case between £21,500 and £22,000. Taking the estimate of either side, however, and deducting it from the £25,373, left a sum which might in round figures be called £4000 as the value of the water undertaking. In conclusion, he suggested that 5 per cent would be ample indemnity for disturbance.

Professor *James Dewar* and Sir *William Crookes* were examined as to the defectiveness of the water supply, especially from Watson's Land. They said they had made joint bacteriological examinations, and found that the well on Watson's Land showed high pollution from sewage; while the general supply was very defective, and was in a most serious condition. An epidemic might break out at any moment. One sample of water taken at the Grand Hotel in August showed 2728 microbes per cubic centimetre.

Mr. *Thomas Bolton*, late Manager of the Grand Hotel, having given evidence,

Mr. *E. Brough Taylor* was examined upon his valuation of the undertaking and the further works necessary, the substance of which was dealt with in Counsel's opening statement. For the purposes of his valuation, he had taken the average of the last four years' maintenance and repairs of works, and adjusted the charge for analysis on the same basis, as being fair towards the Company. He described the alternative scheme of the Council, which provided for 225,000 gallons, as against the 217,000 gallons estimated by the Company's experts as the yield of their proposed works. His net valuation of the concern was £3786.

In cross-examination, witness said he was not prepared to state beforehand what the percentage of working expenses would be under his scheme. From the returns of the London and other Companies, he found that working expenses varied very considerably from year to year.

Mr. *E. H. Stevenson* submitted a valuation varying only slightly from that of the previous witness. He had never in any valuation started from any other figure than the actually ascertained profit of the last year; but in making adjustment, he had not averaged £34 paid for analyses of the waters, because if the undertaking were to be maintained as at present, it was an item which ought to be a matter of account many times a year. The water from shallow gravel wells or tunnels should be continually analyzed. This difference between Mr. Taylor and himself resulted in his figure to be capitalized coming out at £854. In his view, 30 years was the full value. The revenue for a pumping scheme was liable to variation.

In cross-examination, witness said in no case could one say even 60 or 70 per cent. for working expenses was too high, unless one knew all the circumstances.

By Mr. Corbet Woodall: Accepting the resident population supplied by the Company as 12,500, as estimated by Mr. Taylor, he (witness) thought he should not estimate a less supply than 18 gallons per head per day. If it were entirely a resident population, he should be inclined to put it even higher. A summer population did not use so much water as an entirely resident population.

Mr. Cripps then briefly summed up on behalf of the Council.

Wednesday, March 8.

Mr. Balfour Browne, replying for the Company, repeated his previous arguments in support of the valuations arrived at by the experts on his side. Practically the Company were handing over a monopoly to the Council. Parliament, it was true, had a right to revoke the concessions granted to water companies; but neither Parliament nor the Local Government Board, who were able to grant to local authorities power to compete, had ever done so except on the condition that the existing water company should be bought out and fairly compensated for their practical monopoly. He described the action of the Local Authority in latterly using sea water for flushing and road watering purposes, as a rather mean attempt to bring down the value of the undertaking. He complained that the experts on the other side had made no allowance in the expenses of the year for the large item of £665 for pumping and engine charges, fuel, repairs, engines, and labour, which should have been averaged over several years. As to a Stock Exchange quotation, he disputed the contention that it had any bearing on the intrinsic value of the concern. Seeing that with the new scheme they would have 217,000 gallons per day, as against an estimated required quantity of 160,000 gallons in June next, he thought the Company could have made a very good claim for prospective increase; and in not doing so, they were exceedingly moderate. He pointed out that while the percentage of increase in net water-rental was 6·6 in 1898, in 1897 it was 29·2 per cent.; and if an individual year was to be taken there was no reason why the larger figure should not be adopted. Turning then to the evidence of Professor Dewar and Sir William Crookes, he described it as a last dying gasp of chemists pretending to be pathologists, to hold their ground in water analysis. To count the number of microbes in a cubic centimetre of water was no more useful than counting pebbles on the sea shore to

ascertain the quality of the ocean. The only effectual method of finding out whether microbes were dangerous or not, was by physiological experiment upon living animals. As for all the fearful talk about thousands of microbes, people were living at the mercy of thousands of microbes which so far from being dangerous might be described as thousands of saviours to human life. It was perfectly ridiculous to say that the Company's expenses in the future would be 60 per cent.

The proceedings then terminated.

METROPOLITAN WATER SUPPLY COMMISSION.

Fifty-Seventh Day—Monday, March 6.

(*Viscount* LLANDAFF, *Chairman*, *Sir* JOHN E. DORINGTON, Bart., M.P., *Major-General* A. DE COURCY SCOTT, R.E., *Mr.* A. DE BOCK PORTER, C.B., *Mr.* H. W. CRIPPS, Q.C., and *Mr.* R. LEWIS.)

The Commission sat at the Guildhall, Westminster.

The following are the Counsel engaged: Mr. POPE, Q.C., and Mr. CLAUDE BAGGALLAY, Q.C., for the New River and the Southwark and Vauxhall Water Companies; Mr. LITTLER, Q.C., and Mr. LEWIS COWARD for the Kent Water Company; Mr. PEMBER, Q.C., for the Lambeth, East London, Grand Junction, and West Middlesex Water Companies; Mr. RICKARDS for the Chelsea Water Company; Lord R. CECIL for the Hertfordshire County Council; Sir JOSEPH LEESE, Q.C., M.P., for the Kent County Council and Kent Local Authorities; Mr. BALFOUR BROWNE, Q.C., and Mr. FREEMAN, Q.C., for the London County Council and the Corporation of Croydon; Sir R. NICHOLSON for the Middlesex County Council; and Mr. GABRIEL P. GOLDNEY (Remembrancer) for the Corporation of the City of London.

Mr. *Alex. Dickson*, the Secretary of the Kent Water Company, further examined by the CHAIRMAN on the subject of severance, said the capacity of the Company's existing sources outside the County of London was 16½ million gallons daily average supply, whereas the requirements outside London were 4 million gallons a day. On the other hand, the sources of the Company within the County of London were capable of affording 8¾ or 9 million gallons; and the daily requirement within was 12 million gallons, according to the take of the population. If 35 gallons a head daily were allowed, in the latter case the quantity would be 14 million gallons. Thus the sources of supply outside were more than the requirements of the outside districts; while the sources inside were much less than the requirement. This formed one of the difficulties of any scheme of severance—it would make the County of London depend on outside Local Authorities. As the population grew and requirements increased, new sources outside rather than inside the county would be sought; and thus further difficulty would probably arise. There was no absolute impossibility of London having access to these outside sources, unless it were assumed that the sources were to be solely for the use of the Local Authorities. The Rural Authorities in Kent had not exercised their powers of supply under the Public Health Act, but in more than one instance had asked the Company to supply in various districts. Kent had been in favour of the unification of the water supply of the county in the hands of the Company. He believed the supply of water throughout the whole district gave entire satisfaction; there were practically no complaints as to quantity or quality.

The CHAIRMAN: As to control, can you suggest any further control that would be useful to the public beyond what already exists?

Witness: Only such as would eventuate from the operations of the Bill which has been submitted to Parliament by the Companies in regard to intercommunication, under which very considerable control as to the operations of the Companies would rest in the hands of the Local Government Board.

You do not think some supervision as to the extent of your pumping would be useful?—I think that would follow from the operation of the Bill through the supervision of the Local Government Board.

I think not. The Bill, as far as I know, applies to the subject of intercommunication, and the works necessary to render intercommunication possible. It has nothing to do with your ordinary pumping operations at outlying wells. Have you ever had any complaint in Kent about the depletion of streams and wells, such as we have heard of in Hertfordshire?—No, decidedly not.

Have your Company any objection to make public the extent of your pumping and the rest-levels at your wells?—The Chairman of the Company answered this question by saying he thought it was information which might be given to the Local Government Board, but not in a way which should permit any exterior interference or control on the part of private individuals.

Major-General SCOTT: Whether it is published through the Local Government Board or through any other medium, it comes to much the same thing.

Witness said it was a point which required mature consideration as to whether it was expedient that the operations of every water authority should be published in detail in regard to everything connected with their plant or pumping operations. Looking at the matter generally, the principle ought to be adopted of protecting the sources of public water supply, whether in the hands of a company or of an authority; and the publishing of information should be regarded from this point of view. Very valuable information might be afforded other persons by their being able to see what a water company were doing to obtain their water; and it was impossible to say how this information might be used—whether for the advantage or detriment of the Water Companies.

The CHAIRMAN: Your Company claim to have an unlimited power of drawing water from wells?

Witness: Yes, in their district.

The Balfour Commission estimated that a daily average supply of 27½ million gallons could be obtained?—As the minimum quantity which could be safely abstracted. The average daily draught from the Company's wells was 16 million gallons, and the maximum last year 21¾ million gallons.

How much could you draw?—25 million gallons daily with our present plant. With larger machinery we could draw very much more.

Then you disagree with Mr. Cripps's statement before us that the Kent Company's powers were limited to 27½ million gallons a day?—Yes.

By Mr. DE BOCK PORTER: Last year the Company had no complaints of having depleted wells, though they had heard of wells in different parts of the county, some within a mile of their own, in which there was no water. He attributed the failure to the extraordinary deficiency in the rainfall of the year; the rainfall being smaller than anything hitherto recorded.

Further examined by the CHAIRMAN: In view of the somewhat absolute statement of Mr. Cripps that the total possible yield of the chalk would be 27½ million gallons a day, the Company thought it desirable to consult Mr. Whitaker, of the Geological Survey, whose evidence showed that the quantity available in the Company's area would approximate to over 60 million gallons a day, taking both the chalk and the greensand. If the Company went to the east of the Medway, the quantity would be very much larger—something like 196 million gallons. On the basis of the Balfour Commission—35 gallons per head—*plus* 6 per cent. for occasional margin, and allowing 20 per cent. for the margin between the ordinary and the maximum supply, they estimated the total outlay necessary to carry them on to the year 1937 would be £1,500,250. On the basis of the total population of each of the parishes, and not upon the population supplied, the figure would be £1,553,000. At 35 gallons a head, the quantity required in the first case in 1937 would be 51 million gallons, against 21 million gallons at present supplied. The estimate for the future was at the rate of £35,300 per million gallons to be obtained, which was based upon the experience of expenditure in the past. The estimate of the population in 1937 was 1,465,000; the number in 1897 being 512,000. The Company had evidence that the increase of population was taking place at a decremental rate—that it was not increasing as rapidly as between 1881 and 1891. The Company had received applications to take over and supply two extra-Metropolitan parishes not at present within their district. The property in their district was of low rental. The great majority of the houses were under £20 net value. In 1891, there were 48,774 out of 71,459, or about 70 per cent., below £20 per annum. In these cases the charges fell upon the owners by law. This was a disadvantage because the rates were low, and an advantage inasmuch as there was greater surety about getting the money. Witness handed in tables comparing the Kent Company's scale of charges with those of the provincial towns particulars of which had been given by the London County Council, the result of which, he said, was distinctly in favour of the Kent rates, which were shown to be extremely moderate. In some places, there was a public rate; and if this rate was drawn from the water consumers it would have to be added to the charge in the pound to compare with the Kent charge.

The CHAIRMAN remarked that it did seem fair that owners of property should pay something for the public supply.

Witness agreed. Continuing, he said that when the Company was formed there was a Water Company in existence in the Kent area; and the Act of the Kent Company said they should not commence operations until they had bought the rights of the existing Company. That was in 1809; and from that time there had been no competition between the Kent and any other Company. The rights of their predecessors were secured to them under Letters Patent, which gave them the exclusive right of supplying water for 500 years. This charter was acquired by the present Company. So that, without a breach of these Letters Patent, there could be no competition. He thought no public body, if it bought the eight Companies, could save much in cost of collecting, except at great public inconvenience. As to the method of raising future capital, he did not see why the sinking fund clause should be imposed in regard to it, seeing that this clause was originally imposed as a temporary measure in view of the imminence of purchase. If there were to be no purchase, he could not see how the fund was to continue. Moreover, in Kent it would be taking from the consumers the reversion to the share of the surplus profits to which they were entitled, and handing the money over to the Chamberlain for other purposes.

This concluded witness's evidence.

Mr. PEMBER, with reference to the proposal to call a witness from Croydon to give an account of what passed between the Corporation and the Lambeth Company, said as a matter of fact the original lowering of rates by the Lambeth Company took place in July, 1894. They had received complaints as to the quantity and quality of the water; and they believed that these complaints really pointed to a reduction of rates. The Company therefore did so reduce the rates. Mr. Wilkins, the Secretary of the Lambeth Company, was therefore right in saying that in the first instance they were not reduced in consequence of competition. Mr. Wilkins, however, forgot that subsequently there was a conference between the Engineers of the Corporation and the Company, at which it was agreed that if the rates were kept down to the reduced level the Corporation would not compete. They had been kept down since then, in consequence of what they might call the fear of competition. This was the mistake Mr. Wilkins had made, and which he wished to correct. Counsel said he now left on Mr. Balfour Browne the responsibility of wasting time by calling further evidence

Mr. BALFOUR BROWNE said there was another statement by Mr. Wilkins, that they had taken from the Croydon Corporation 69 houses that might have been supplied by Croydon. The fact was that it was under the terms that the Company should keep down the rates to the Croydon level that the Corporation did not lay pipes in the streets in which the Company had mains; and these 69 houses were put upon the pipes of the Company in streets in which the Corporation promised not to compete.

Mr. PEMBER said that was true, except as regarded a block of about 20 houses, about which he did not care.

Mr. BALFOUR BROWNE said Mr. Wilkins also stated that the Croydon Corporation were at the end of their tether. Though the Corporation once warned the people to be careful, they were never really short; and they were now making provision for the supply in the future of large quantities of water.

Some further conversation followed, as a result of which it was understood that no evidence from Croydon would be called.

Sir *F. Dixon-Hartland*, M.P., Chairman of the Thames Conservancy Board, and an Alderman of the Middlesex County Council, was then examined by the CHAIRMAN. As to allowing the Water Companies to take

their authorized supply for an average of six months instead of day by day, witness said the Conservators would have no objection to this, if it was done in such a way that they could not take a very small quantity when the river was full and a large quantity when it was empty. They were a navigation authority; and their great duty was to keep the navigation of the river in a proper state. They were rather afraid that the Companies might, if they had an average, take much less water when there was a large quantity in the river, and in the very dry season take a great deal more. The method of checking the quantities the Companies pumped was prescribed by Act of Parliament, and was satisfactory. He should be content with the six months' average, provided they took the water when the river was full; but he should like to control the draught when the water was low. He adhered to the necessity of the 200 million gallons limit. Unless reduced by Nature, this should be the minimum. The Thames Companies at present had little storage; he thought they should have at least ninety days' supply. The Conservancy were quite content to let the Companies draw their present 130 million gallons; but it should be done under storage conditions, so that the water should be taken when the river was full. As to allowing the Local Government Board to relax the limits of draught of the Companies, the Conservancy had a strong objection to this, because Parliament had settled the rule, the amount, and the way it was to be done, after most careful investigation; and if one of the Ministers had a right at a moment's notice to overthrow everything Parliament had done, the Conservancy Board would not know where they were. He should not object to such power of relaxation being given to the Conservancy Board.

Major-General Scott remarked that the demands for navigation would have to give way if there was an absolute scarcity, and the consumers were suffering from want of water.

Witness said it was not for the Conservancy to save the Companies from having to make storage reservoirs. The principle of the Conservancy was that with ninety days' storage there was ample water in the Thames for a hundred years. If the Companies provided for very dry seasons, there would be no difficulty. The Board objected to the flow being ever below 200 million gallons; but as Parliament had said the Companies could take 130 million gallons, the Board could raise no objection even if the taking of this quantity reduced the flow below 200 million gallons.

The Chairman: I certainly have always understood that our predecessors on Lord Balfour's Commission recommended that the 130 million gallons should be put under the same conditions of storage as any further supply that might be granted.

Witness: It has not been done though.

I know it has not. Nothing has been done in consequence of the Balfour Commission, and nothing will be done in consequence of ours?—I do not know. We are looking forward a great deal to your report. All the Bills are held over in the House, in the hope that your report will be out before they are brought in.

In further examination, witness expressed the opinion that more dredging was necessary—the result of which would be to deepen the channels, and allow floods to pass more rapidly—and that the work of supervising the drainage flowing into the Thames was being done satisfactorily.

Sir *Edward Frankland* was then called and examined by the Chairman. He handed in some elaborate diagrams showing the results of continued examination of samples of filtered and raw water taken at the intakes and from the filter wells of the five Thames Companies. One diagram covered seven years' examinations, and a very large number of samples; and it showed that when the raw Thames water contained more microbes the filtered water generally also contained more, but the rise in the number in one case was by no means in exact correspondence with the number in the other. The microbes increased with the increase of the flood.

The Chairman: We have heard the contrary from high scientific authorities. However, that is your view?

Witness: Yes. I have tested it for several years.

We have also heard from high scientific authorities that the condition of the filtered water does not depend upon the state of the raw water that was put upon the filters, but upon the excellence of the method of filtration?—Yes.

If filtered properly, it does not matter how many microbes there are in the raw water; it will come out equally good?—Yes, that was Professor Dewar's opinion; but it does not agree with my experience.

The only practical question for us is whether it is safe to take flood water into the reservoirs of the Companies?—There is no doubt that every day of storage of flood water diminishes the number of microbes in the water; and therefore it is quite possible, though it has not yet been proved, to take the top of flood water into storage reservoirs where it will be stored three or four months, and to get potable water from it. Every day water is stored it improves greatly in microbial quality.

I take it that in your judgment the safest treatment (certainly for flood water, and, indeed, for any water) is to put it into subsidence reservoirs?—Certainly.

And given sufficient subsidence reservoirs you might safely take even top flood water?—Yes, I think that is quite a possibility. After the top of the flood water has gone by, the other could be taken with perfect safety.

Another result I gather from your evidence, and from your differences with Professor Dewar, is that the whole of this subject is still rather in an inchoate state?—It is.

In further examination, witness said, with regard to the recommendations of Lord Balfour's Commission in paragraphs 176 and 177 of their report, improvements had been made in filtration; and filtration was much better understood now in its relation to bacteriology than at the time of the Balfour Commission. But he did not think inquiries had proceeded far enough to warrant legislation upon them, or the framing of regulations. There were some things that had been established—that it was possible with efficient filtration to keep the microbes to a number not exceeding 100 per cubic centimetre; that this was best effected by using very fine sand, especially on the surface of the filters; and that a very thin stratum comparatively of fine sand was much more efficient in arresting microbes than a thick stratum of comparatively coarse sand. He therefore suggested that the sand to be used on the surface of the filters should be of such fineness that it would pass through a copper gauze sieve of 1600 meshes to the square inch (that was the sand used by the West Middlesex Company); that the rate of filtration should not exceed 2½ million gallons per acre per 24 hours; and that the number of microbes in the water as it left the filters should not exceed 100 per cubic centimetre. These things might be laid down as rules for the guidance of the Companies.

By Mr. Cripps: He had never, in all his examinations during the seven years, been able to catch a mischievous microbe.

The Chairman: Is not your experience large enough to lead you to suppose there are no dangerous ones?

Witness: I should say it is exceedingly likely; but it has not absolutely been proved.

Do you think it would be useful to vest in some officer or person power to control the mode of filtration adopted by the Companies, or would you leave the responsibility of that to the Companies?—It would be desirable that there should be such an officer who should give advice to the Engineers of the Companies on this, and blame them, and perhaps even fine them, if they delivered water which was not up to the standard, in consequence of not taking the advice.

In further examination, witness suggested the establishing of such an experimental station as the State Board of Health of Massachusetts, to make experiments with regard to filtration, and decide the standard and state the kind of filters which would enable them to always obtain water up to this standard—with not more than 100 microbes per cubic centimetre. There should be three bacteriological laboratories near the works of the Companies—one at Hampton, one at the New River Company's works in Green Lanes, and another at Lea Bridge—where bacteriologists could take samples, and cultivate them on the spot, of raw and stored river water, and of filtered water as it issued from the filter-beds of each Company. The times of greatest danger were those of severe frost and great heat. It was desirable each Company should have at least thirty days' storage as a minimum, in order to avoid the direct introduction of flood water on the filters. The condition of the river water was always reflected in the filtered water, but in a lower degree, both as to the chemical and bacterial quality. Storage had very little influence on the chemical, but a great deal of influence on the bacterial, quality of the water. He thought matters were hardly ripe for additional control; and he rather pointed to additional investigation and inquiry. The tendency of his mind was to let the control extend only to the ultimate results, and leave the Companies responsible for how these results were to be obtained. The experimental work in regard to filtration might go on for a couple of years yet before conclusions could be arrived at. Then having arrived at certain conclusions, these conclusions should be brought into operation by legislation. It seemed to be taken for granted that a future additional supply of water for the Metropolis could only be obtained from Wales. This was by no means the case, for a detailed account of a scheme for supplying water to London from the Lakes of Cumberland and Westmoreland was given in the report of the Duke of Richmond's Commission. The distance from Ullswater to the proposed reservoir at Edgware was 270 miles; while the estimated cost of bringing a daily supply of 250 million gallons (which could be increased to 350 million gallons), including land, compensation, easements, severance, and every other expense, was £13,500,000. In his opinion, therefore, it was not necessary, on the supposition that there was no other place to go to, to buy up a portion of Wales so as to supply the Metropolis in fifty or a hundred years' time.

By Mr. Freeman: His system was such that he could collect and analyze samples of all the Companies' water in one or two days. One improvement he should like to see would be a separate well for each filter, so that a bacteriological examination of the produce of each filter would be possible.

Mr. Pember: Have you any cause to say that during the last three or four years any improper water has been sent down for consumption in London by a Water Company?

Witness: No; on the contrary, I should say no improper water has been sent down in that time.

Fifty-Eighth Day—March 7.

The only members of the Commission absent to-day were Sir G. Bruce and Mr. H. W. Cripps, Q.C.

Mr. *W. Whitaker*, F.R.S., formerly Senior Officer of the English Staff of the Geological Survey, said he had given careful consideration to the question of the quantity of water obtainable in the district of the Kent Company, and of its possibilities of extension. As the result of his inquiries, he estimated the following daily yields per percolation unit: From the basin of the Ravensbourne, 800,000 gallons; from the basin of the Darent, 3,350,000 gallons; from the basin of the Darent to the River Medway, 2,350,000 gallons; from the basin of the Medway, east of the River, 1,500,000 gallons; from the basin of the Swale, 2,250,000 gallons; from the basin of the Stour (except Thanet), 5,300,000 gallons; from the Thanet, 1,500,000 gallons; from the basin of the Dour, and between it and the Stour, 1,650,000 gallons; and allowing for 26 miles of escarpment (at about three-quarters of the percolation of other bare chalk, from the sharp slope, and from the more clayey nature of some of the chalk), about 750,000 gallons—making 19,450,000 gallons in all. Taking the estimate of percolation at 8 inches, it would not be going beyond the mark to multiply this figure by eight, which would give 156 million gallons a day as the possible yield to the Kent Company from the chalk. In his opinion, the Kent Company could certainly double their present supply, with some easterly extension; and if a considerable easterly extension was made, the Company could probably do more than treble the supply from the chalk. Besides the chalk, there was another source of supply open to the Kent Company. Although the lower greensand was by no means equal to the chalk as a great water-bearing formation, yet valuable additional supplies might be obtained from it. The lower greensand, as a whole, was more permeable than the chalk; but there would probably be greater difficulty in getting water from it, on account of the comparative narrowness of the outcrop (by reason of which it was more difficult to establish pumping stations that would command a large area), and of the possible inflow of sand with the water. He estimated the daily yield from the lower greensand at about 5 million gallons per percolation unit; and this, multiplied by eight, as in the case of the chalk, would give a total yield of 40 million gallons a day. Much water was already obtained from the lower greensand along the valley of the Medway, by borings through the chalk and gault, but not in the case of the Darent. He believed that

valuable additional supplies might be obtained there as well as at several other places.

Mr. *Richard Hack*, Engineer to the Chelsea Water Company, said they were increasing the capacity of their reservoirs at Molesey by raising the embankments around them so as to add 50 million gallons to the storage. When the work was completed, at the end of the present year, it would give a 14 days' supply. The water in the reservoirs would be 23 feet deep, of which it would be necessary to discard 4 feet for mud in drawing off the water. The longest time he had ever known a filter to run without clogging was fifteen weeks; and the shortest time was five or six weeks. The largest quantity of water passed through their filters collectively in the course of a day was 14 million gallons. He did not consider that the regulations recommended by the Balfour Commission were necessary in the case of the Chelsea Company; but he had been instructed to construct separate wells for the purpose of enabling samples to be taken from each filter. He saw no objection to the establishment of laboratories in the neighbourhood of the filters, as suggested by Sir Edward Frankland, in order that the water might be tested on the spot. The Chelsea Company were able to conform very nearly to the official standard of 100 microbes per cubic centimetre; but this had been exceeded on three occasions, upon one of which the largest number of microbes discovered in a cubic centimetre of Chelsea water was 234, as against the smallest number of 23·13. He did not believe it would be possible absolutely to maintain the standard of 100 microbes per cubic centimetre, as a matter of statutory obligation. Even if a sample were taken from a particular filter which was found to be producing too many microbes, they might not be able to discover to what it was due; but they would know where to go to work, and they would at once draw off the water and clean the sand. On the recommendation of Sir Edward Frankland, they were using sea sand in the filters; and in the opinion of eminent chemists, the results now obtained by filtration were satisfactory. The habitual admission of flood water on to the filters would not tend to lower the average quality of the water, but would increase its colour. The water was usually taken into the reservoirs nine days after a flood; but in certain circumstances it was taken as soon as four or five days after.

By Mr. RICKARDS: When the raising of the walls of the reservoirs at Molesey was finished, they would have a capacity of 190 million gallons.

Mr. *Ernest Collins*, Engineer to the New River Company, said the number of their supplies in December last was 165,534, of which 151,251 houses received constant supply (being 91 per cent. of the whole), and 145,000 were under the meter system, by which waste was localized, and the inspectors were assisted in their work. The Company had benefited very much by the introduction of this system, having combined with it the system of testing and stamping all waste fittings before they were put into the houses. This method, having met a public want, was utilized by most firms of builders; its popularity being proved by the fact that 95 per cent. of all the fittings used in the Company's district bore the New River stamp. In his opinion, the system of proper control of water-fittings, including the use of stamped fittings throughout, should be made compulsory. The average consumption of water per head per day in the New River Company's district was 30½ gallons—the lowest of any of the London Companies. But there was still room for improvement; and he believed that in time the waste would be further reduced. As an example, the consumption in the Shoreditch district had been reduced from 36·8 gallons per head per day in 1882 to 15·3 gallons in 1898. In the Tudor Street district in the City, where the supplies were for printing and other trades, and were utilized day and night by a shifting population, the daily supply was 59·4 gallons per head, of which 32·8 gallons was consumption and 26·6 gallons waste. Then, again, in the Finsbury Park district, comprising 123 houses with large gardens, and an estimated population of 1001, the supply in June, 1897, was 105·4 gallons per head per day, of which 18·3 gallons was consumed and 87·1 gallons wasted, by being allowed to run all night through the hose into the gardens. In September of the same year, the supply was reduced to 32·5 gallons per head per day, of which 24·9 gallons represented consumption and 7·6 gallons waste. By the introduction of proper fittings, it would no doubt be possible to reduce the supplies of the other seven London Water Companies to the same average rate per head per day as that obtained by the New River Company; and he calculated that if the New River standard had been attained by the other Companies, it would have been possible to have effected a gross saving of 28,006,049 gallons a day in 1897, and 22,743,253 gallons in 1898.

Mr. *George Corble*, Clerk to the Lea Conservancy Board, stated that the tonnage of goods passing over the ancient navigation of the Lea was now about 600,000 tons per annum; and the tolls for the last financial year amounted to £15,577. The New River and East London Companies paid water-rents amounting to £3500, in addition to which the former Company had paid a capital sum of £40,000 towards the improvement of the Lea. The two Companies jointly found a sum of £1000 per annum for "protection of water" purposes—*i.e.*, keeping sewage and offensive matter out of the river, &c. In an action against the Hertford Corporation in 1886, as to the sewage, the Conservancy spent £6000 in costs. From 1893 to 1897, the two Companies virtually repaid this to the Conservancy by an annual voluntary payment of £1500. Since then the Companies had made, and were still making, a voluntary contribution of £1125 to the funds of the Conservancy. The Conservators thought that, considering the quantity of water taken from the Lea by the Companies, they ought to continue the extra payment of £1500 permanently. During the drought of last year, the Lea Conservancy had to be very careful as regarded the water. Except some delays in the Limehouse Cut, caused principally by the neap tides, the navigation was not stopped (as was the case with many canals in England) during the whole of the summer. It was marvellous where the water came from, considering the small flow over Fielde's Weir; and it was believed there must be some very large spring in the bed of the old Lea between Fielde's Weir and London. The navigation might take 5,400,000 gallons per day if they wanted it; but about 1,500,000 gallons sufficed to pass the barge traffic, supposing Limehouse Cut to be a foot under head, and the barges aground. Complaints were made, and it was urged that the Board should pass down the balance of water—about 4,000,000 gallons—from the upper reaches, to try and make up the head in Limehouse Cut; but on several occasions there was not the water to do it. Then again, if they had done it, it would have denuded the upper pools by a foot of water, which would not have been made up for many days, and would have stopped the traffic during that

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 649.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
690,000	10	Oct. 13	10½	Alliance & Dublin 10 p. c.	22½—23½	..	4 9 4
100,000	10	,,	7½	Do. 7 p. c.	16—17	..	4 8 3
300,000	100	Jan. 3	5	Australian 5 p. c. Deb. .	104—106	..	4 14 4
200,000	5	Nov. 11	6	Bombay, Ltd. . . .	6¾—7¼	..	4 2 9
40,000	5	,,	6	Do. New, £4 paid .	4¾—5¼	..	4 11 5
380,000	Stk.	Feb. 24	12	Brentford Consolidated	270—280	..	4 5 9
240,000	,,	,,	9	Do. New	212—217	+2	4 2 11
50,000	,,	,,	5	Do. 5 p. c. Pref. .	140—145	..	3 9 0
159,375	,,	Dec. 15	4	Do. 4 p. c. Deb. .	128—133	..	3 0 2
220,000	Stk.	Sept. 15	11½	Brighton & Hove Orig. .	270—275	+3	4 3 8
226,320	,,	,,	8½	Do. A. Ord. Stk. .	197—200	..	4 5 0
973,500	Stk.	Feb. 24	5	Bristol, 5 p. c. max. .	125—130	..	3 16 11
480,000	20	Sept. 29	10	British	48—50	..	4 0 0
50,000	10	Feb. 24	12	Bromley, Ord. 10 p. c. .	25—27	..	4 8 11
75,000	10	,,	9	Do. 7 p. c. . . .	20—22	..	4 1 10
500,000	10	Oct. 13	6	Buenos Ayres (New) Ltd.	10¼—10¾	..	5 11 7
220,000	Stk.	Dec. 30	4	Do. 4 p. c. Deb. .	100—102	..	3 18 5
150,000	20	Mar. 10	8½	Cagliari, Ltd. . . .	28—29*	..	5 13 10
100,000	10	Sept. 29	7	Cape Town & Dis., Ltd.	14—15	..	4 13 4
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	57—59	..	5 1 8
550,000	Stk.	Oct 13	13½	Commercial Old Stock .	312—317	..	4 5 2
200,750	,,	,,	10½	Do. New do. .	242—247	..	4 5 0
200,750	,,	Dec. 15	4½	Do. 4½ p. c. Deb. .	145—150	..	3 0 0
800,000	Stk.	Dec. 15	10	Continental Union, Ltd.	202—206	..	4 17 1
200,000	,,	,,	7	Do. 7 p. c. Pref. .	187—192	..	3 12 11
51,600	Stk	Feb. 24	14	Croydon A 10 p. c. . .	805—810	..	4 10 4
168,400	,,	,,	11	Do. B 7 p. c. . .	255—265	..	4 8 0
555,000	Stk.	Feb. 24	5½	Crystal Palace Ord. 5 p c.	130—135	..	3 17 9
60,000	,,	,,	5	Do. 5 p. c. Pref. .	140—145	..	3 9 0
486,090	10	Jan. 27	11	European, Ltd. . . .	22½—23½	..	4 13 7
254,060	10	,,	11	Do. £7 10s. paid .	17—18	..	4 11 9
14,993,075	Stk.	Feb. 10	4½	Gas- 4 p. c. Ord. . .	118—120	..	4 1 8
2,600,000	,,	,,	3½	light 3½ p. c. max. .	100—102	..	3 8 8
3,799,735	,,	,,	4	and 4 p. c. Con. Pref.	127—129	+1	3 2 0
3 843,975	,,	—	—	Coke 3 p. c. Con. Deb.	101—103	..	—
70,000	10	Nov. 11	8	Hongkong & China, Ltd.	13½—14½	..	5 10 4
3,800,000	Stk.	,,	10	Imperial Continental .	223—228	..	4 7 9
376,400	100	Feb. 1	4	Do. 4 p. c. Deb. Red.	98—101	..	3 19 3
478,600	Stk.	Feb. 10	3½	Do. 3½ p. c. Deb. ,,	102—105	..	3 6 8
75,000	5	Nov. 30	6	Malta & Medn., Ltd. .	5—5½	..	5 9 1
560,000	100	Oct. 1	5	Met. of 5 p. c. Deb.	112—114	..	4 7 9
250,000	100	,,	4½	Melbourne 4½ p. c. Deb.	107—109	..	4 2 7
541,920	20	Nov. 11	5	Monte Video, Ltd. . .	15½—16½	+½	6 1 3
617,946	Stk.	Feb. 24	9½	Newc'tle & Gatesh'd Con.	228—233	..	3 19 5
264,855	Stk.	Dec. 30	3½	Do. 3½ p. c. Deb. .	107—110	..	3 3 8
					* Ex div.		

Issue.	Share.	When ex-Dividend	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
150,000	5	Nov. 30	8	Oriental, Ltd. . . .	7½—7¾	..	5 3 3
135,000	5	,,	8	Do. New, £4 10s. pd.	6¾—6¾	..	5 6 8
15,000	5	,,	8	Do. do. 1879, £1 pd.	1¾—1¾	..	4 11 5
60,000	5	Sept. 29	7	Ottoman, Ltd. . . .	5—5½	..	6 6 2
500,000	100	Dec. 1	6	People's Gas 2nd Mtg. of Chicago Bonds .	102—106	..	5 13 2
848,070	10	Oct. 18	6	River Plate Ord. . . .	10¾—11	+½	5 9 1
250,000	Stk.	Dec. £0	4	Do. 4 p. c. Deb. .	103—105	+1	3 16 2
250,000	10	Sept. 29	10	San Paulo, Ltd. . . .	16½—17	..	5 17 8
135,000	Stk.	Sept. 15	10	Sheffield A.	242—245	..	4 1 8
209,053	,,	,,	10	Do. B.	242—245	..	4 1 8
447,427	,,	,,	10	Do. C.	242—245	..	4 1 8
5,600,000	Stk.	Feb. 10	5½	South Metrop., 4 p.c. Ord.	144—146	−½	3 13 0
1,460,000	,,	Jan. 18	3	Do. 3 p. c. Deb. . .	101—103	..	2 18 3
—	—	—	—	Tottenham and A. .	—	—	—
—	—	—	—	Edmonton B. .	—	—	—
189,380	10	Dec. 30	5	Tuscan, Ltd.	94—10½	..	4 15 3
149,900	10	Jan. 3	5	Do. 5 p. c. Deb. Red.	99—101	..	4 19 0
				WATER COMPANIES.			
746,184	Stk.	Dec. 30	11	Chelsea, Ord.	320—325	..	3 7 8
150,000	,,	,,	5	Do. 5 p. c. Pref. .	168—173	..	2 17 10
160,000	,,	,,	4½	Do. 4½ p. c. Pref. '75	150—155	..	2 18 1
175,785	,,	Sept. 29	4½	Do. 4½ p. c. Deb. .	157—162	..	2 15 7
1,720,560	Stk.	Oct. 18	7	East London, Ord. . .	218—223	..	3 2 9
654,740	,,	Dec. 30	4½	Do. 4½ p. c. Deb. .	157—160	..	2 16 3
390,000	,,	,,	3	Do. 3 p. c. Deb. .	101—103	..	2 18 3
700,000	50	Dec. 15	7½	Grand 10 p. c. max. .	112—115	..	3 5 3
310,000	Stk.	Sept. 29	4	Junction 4 p. c. Deb. .	138—143	..	2 15 11
708,000	Stk.	Feb. 10	14	Kent	360—365	..	3 16 9
160,000	,,	,,	7	Do. New, 7 p. c. max. .	210—215	..	3 5 1
1,043,800	100	Dec. 30	10½	Lambeth, 10 p. c. max. .	298—303	..	3 9 4
406,200	100	,,	8	Do. 7½ p. c. max. .	230—235	..	3 8 1
350,000	Stk.	Sept. 29	4	Do. 4 p. c. Deb. .	138—143	..	2 15 11
500,000	100	Feb. 11	13⅓	New River, New Shares	433—438	..	3 2 9
1,000,000	Stk.	Jan. 27	4	Do. 4 p. c. Deb. .	137—142	..	2 16 8
902,300	Stk.	June 29	7½	South- Ord. . . .	202—207	..	3 12 6
126,500	100	,,	7½	wark 7½ p. c. max..	190—195	..	3 16 11
489,200	Stk.	,,	5	and 5 p. c. Pref.	168—171	..	2 18 6
1,019,585	,,	Oct. 13	4	Vauxhall 4 p. c. A Deb.	138—143	..	2 15 11
1,155,066	Stk.	Dec. 15	10	West Middlesex . . .	300—305	..	3 5 7
200,000	,,	,,	4½	Do. 4½ p. c. Deb. .	159—162	..	2 15 7
200,000	,,	Mar. 10	8	Do. 8 p. c. Deb. .	101—103*	..	2 18 3
					* Ex div.		

time, besides wasting the water, which would have been discharged into the Thames, at a time when the east of London was crying out for water to drink. The Conservancy considered that, under the circumstances, it was less injury to cause delay to a few barges in the Limehouse Cut, than to waste the water required for drinking purposes. The Board could not ignore the position and rights of the Water Companies, and the fact that a large part of the Conservancy's income was derived from water-rents.

The CHAIRMAN: The Lea Conservancy Board were appointed to keep the river clear for navigation. Yet they have deliberately sacrificed the interests of the navigation to those of the Water Companies. You appear to have pumped up just enough water from pond to pond to enable the barges to scrape through; and the whole thing is lubricated by the payments of the Companies. As a matter of fact, was not the Lea exhausted during the past year?

Witness: I will not use the word "exhausted." It was "hard up." In order to keep the navigation going, we had to borrow water from the Regent's Canal.

What have you to say with regard to the future?—The East London Company in their Bill this year are seeking power to make two more large reservoirs in the neighbourhood of Ponders End and Enfield Lock; and they have calculated in their storage capacity sufficient to pass into the Lea Navigation enough water to make up the maximum daily quantity of 5,400,000 gallons, if it is necessary to have it. In times of flood, there is an enormous flow down the Lea Valley into the Thames, which, if stored, would be of great value and help to the Companies. In ordinary wet seasons, they could still take between them from the Lea 50 or 60 million gallons daily, and leave plenty of water for navigation purposes and flushing.

The Commission then adjourned.

The fifty-ninth sitting of the Commission was held yesterday, at the Guildhall, Westminster—Lord Llandaff presiding. The witnesses on the list for examination were Mr. Urban Smith, Engineer to the Hertfordshire County Council, and Mr. Baldwin Latham, who also appeared in the interests of Hertfordshire. These are the only two witnesses whom it is at present proposed to call. The final stage of the inquiry—the speeches of Counsel—will then be reached. In opening, Mr. Balfour Browne referred to remarks made by the Chairman as to the indefiniteness of the impression left on his mind by the evidence of the County Council in regard to purchase. He (Mr. Balfour Browne) had carefully considered this with the Committee of the Council, and as a result pointed out that the Bill for the purchase of the undertakings of the eight Companies was now before Parliament, and contained a special arbitration clause (the clause discussed before Mr. Plunket's Committee in 1895), which clause was itself an answer to the Chairman's question—namely, that it was expedient to purchase the undertakings upon special terms of arbitration. As to whether the Council thought purchase was expedient upon any terms of arbitration, as the Council's definite proposal was now before the House of Commons, and as their witnesses might be called upon to support it before a Committee of Parliament, it was impossible to say anything that might be construed to commit the Council to accept any terms of arbitration that might be imposed upon them. At the same time, the Committee thought it did not necessarily follow that the precise clause contained in the present Bill afforded the only means of obtaining fair terms of arbitration. The County Council's contention was that the fair value of the Companies' undertakings should be ascertained by a court of arbitration of the highest standing, with the fullest powers to inquire into all the circumstances of each individual case. Evidence was subsequently called.

PLYMOUTH CORPORATION WATER SUPPLY.

Some Interesting Statistics.

Mr. E. Sandeman, the Water Engineer to the Plymouth Corporation, has presented to the Water Committee a report on the progress of his department during the past year, together with figures showing the advance made since 1890. The number of domestic supplies on Dec. 31, 1898, was 15,407—an addition of 829 in the year. The increase since 1890 has been 4426—an average of about 500 per annum; the highest number being reached last year. Trade supplies by meter number 219, or 59 more. In 1889, the quantity of water supplied for trade purposes was 297¾ million gallons; while last year it was 540 million gallons—an increase in ten years of 81 per cent. The total consumption of water, which was between 60 million and 70 million gallons per quarter in 1890, reached its maximum in the September quarter of last year, when it exceeded 170 million gallons; the previous maximum having been 130 million gallons in the September quarter of 1897. The revenue for 1897 was £18,707, and for 1898 it was estimated at £20,000. In 1890 it was £13,650; and it has shown a steady increase notwithstanding that the charges to a portion of the district have been lowered 50 per cent. in consequence of its amalgamation with the borough. Maintenance charges amounted to £5169, of which sum £1918 was for salaries. New mains to the extent of 5 miles 1619 yards were laid last year. Mr. Sandeman states that since 1895 nearly the whole of the repairs to meters have been executed by Corporation workmen instead of by the makers, with the result that the cost has been reduced from an average of 4·6 per cent. per annum on the total value to 1·5 per cent. per annum. The majority are inferential meters of the Siemens type; and it is on this class of meter that the saving in repairs has been made. Other meters are in use; but experience shows that the Siemens meter is the most suitable to employ. Of 11,340 house fittings tested for plumbers and others, 275, or 2·4 per cent., were rejected.

The New Water-Works for Loughborough.—On the advice of the Water Committee, the Loughborough Town Council have decided that the first instalment of the loan which it will be necessary to raise for the purposes of the Blackbrook water scheme shall be £25,000.

RICHMOND'S
"KITCHENER" COMPETITION.

RESULT.

The chosen word is "NIHIL" (often pronounced "NILE"), meaning, of course, that no reply was received from Lord Kitchener.

Out of the many hundred Competitors, only TWO gave the correct word. Their names are—

A. M. ARCHER, JUN., GAS-WORKS, BRIDLINGTON QUAY,

AND

JOHN GIBSON, 32, WESTFIELD ROAD, HORNSEY, LONDON, N.

Mr. ARCHER'S form having been taken from the Competition Hamper first, he takes the PRIZE OF A TRIP TO LUCERNE AT EASTER. Mr. GIBSON will also receive a Prize.

FULL PARTICULARS WILL BE GIVEN IN OUR "KITCHENER" SUPPLEMENT TO BE SHORTLY ISSUED.

132, Queen Victoria Street,
London, *March 13, 1899.*

THE PROPOSED MUNICIPALIZATION OF THE DEVONPORT WATER-WORKS.

The scheme for the municipalization of the Devonport Water-Works has got into a peculiar tangle. Last year the "Progressive" members of the Town Council very warmly supported it. They engaged the services of Mr. Diggle, who reported in favour of the purchase. Strong opposition was manifested to the scheme; and both inside and outside the Council keen criticism was offered to the action of the Corporation Committee who had the matter under consideration, and who refused to publish Mr. Diggle's report. There was a good deal of heated controversy, which ended in the postponement of the subject until after the November elections. These resulted in a gain of numbers to the Progressive party, who thereupon appointed on the Water Committee the most prominent of the opponents of municipalization, in order, as was said, to deprive them of the opportunity of saying there was anything secret in the proceedings, and also to cast upon them the responsibility of accepting or rejecting the scheme. This manœuvre has been met by a countermove. Members of the Committee elected against their will simply stayed away from the meetings, with the result that on Thursday last the Committee reported to the Council that, in consequence of the small attendance and the indifference shown in the matter, they were unable to take the responsibility of coming to a decision. Mr. Shepherd, a member of the Committee, said that at the most only eight out of the seventeen members attended the meetings; and there was no evidence that those who opposed the scheme last year had altered their attitude. Mr. Whitfeld, who was the prime mover in the purchase scheme last year, warmly denounced those who had, as he said, thwarted the work which the Council entrusted to the Committee. He added that the time had come when, in connection with so important a matter, personalities should be dropped, and politics should not sway their action; but he expressed the opinion that there was a combination of interests outside as well as inside the Council to prevent the Corporation getting possession of undertakings owned by companies. It was decided to disband the Committee, and to refer the subject to the whole Council, who are to go into the question as soon as practicable. This suggests the possibility of a public disclosure of the contents of the report, which have hitherto been kept private because the promoters of the scheme did not wish to play into the hands of the Company.

Good Management at the Barry Gas-Works.—At the last meeting of the Gas and Water Committee of the Barry Urban District Council, the Engineer and Manager (Mr. F. M. Harris) reported that during the past year 1100 slot and ordinary gas-meters and 1200 cooking-stoves had been fixed, and that there was every probability of the make of gas reaching 100 million cubic feet in the current year. It was also reported that there had not been one penny of bad debts in connection with the Gas Department for more than two years.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The transition, or transformation, from Gas Company to Corporation, has now taken place at Peebles. A year ago the two bodies were facing each other with clenched fists and beetling eyebrows; and to-day there is perfect amity between them. The Company, having received fair, though by no means full, terms, have retired, and are practically now non-existent. The Corporation have taken their place. This is the material fact; the intellectual one is no less striking. The men who a year ago were convinced that the Gas Company were managing a concern which was beset by many difficulties, and was probably on the verge of ruin, are now persuaded that the supplying of gas in the burgh is a business in which there is profit. The gentleman who most decried the Company is now the corner-stone of the gas undertaking; and a scheme of adventure has been launched which goes farther than anything I know of in either company or corporation management of gas affairs.

The Commissioners met at the end of last week, and they had before them a letter from Mr. J. Johnston, C.A., who had been appointed temporary Treasurer, suggesting that they would probably be disposed to appoint a permanent Treasurer—in which event he would be prepared to demit office on March 31. It probably was not providential that, before the arrival of this letter, the Treasurer of the Burgh (Mr. W. H. Williamson) had resigned his post, and his councillorship as well. He was thus eligible for the post of Treasurer to the Gas Commission—a salaried office, which cannot be held by a member of the Corporation. Provost Ballantyne moved Mr. Williamson's appointment, on the grounds of his great intimacy with the subject (his study of it having been proceeding night and day), and of the great interest Mr. Williamson took in the carrying through of the transfer. There was general unanimity that Mr. Williamson was the best man the Commissioners could secure for the office; and he was unanimously appointed, at a salary of £70 a year. I quite agree that Mr. Williamson is the best Treasurer the Peebles Gas Commissioners could have obtained.

The Gas Committee reported that they had given careful consideration to the subject of the introduction of gas-cookers as a means of increasing the sale of gas. From information they had received as to the results in other towns, they were satisfied that a great extension of business would follow a more general use of cookers in Peebles. The scheme which they recommended would necessarily entail a considerable outlay of capital; but they were convinced that the increased sale of gas would give a large return for the outlay, and that the cookers would prove a profitable investment—especially if accompanied by prepayment meters. While the Committee were aware that their proposals were more liberal to gas consumers than those of any other corporation or gas company, they felt that the course they recommended was justified by the universal experience that the more liberal the arrangements with consumers, and the greater the facilities offered for the use of gas, the better was the result. They were further strengthened in their opinions by the fact that the more enterprising and forward corporations were gradually abolishing the rents

R. & A. MAIN, Ltd.

Argyle Works, GLASGOW.

Telegrams: "GASMAIN, GLASGOW."

109, Farringdon Road, LONDON, E.C.

Telegrams: "GASMAIN, LONDON."

BRISTOL:
28, BATH STREET.
Telegraphic Address: "GOTHIC."

BIRMINGHAM:
1, OOZELLS STREET.
Telegraphic Address: "GOTHIC."

MANCHESTER:
87, BLACKFRIARS STREET.
Telegraphic Address: "GOTHIC."

THE

"Main" Cooker,

With Enamelled Grids and Shelf Guides.

SEVERAL COLOURS OF ENAMELLED LININGS.

Prices from - - £4 12s. 6d.

they charged for cookers, and also reducing the charge for gas consumed through prepayment meters, which were supplied free. The object of the Committee was to promote in every way the usefulness of the gas undertaking to the community, while working it on sound financial as well as economical lines. The recommendations of the Committee were that prepayment gas-meters and small cooking apparatus, all fixed and fitted up, be supplied to gas consumers free of charge; that when more expensive cookers were desired, a small rental should be paid by the consumer; and that the gas used be charged for at the rate of 1d. for 20 cubic feet, or 4s. 2d. per 1000 cubic feet, which is the same rate as is charged to ordinary consumers. The particulars of the proposals of the Committee were: (1) That grillers costing up to 15s., and with prepayment meters, should be offered free, fitted up; (2) that cookers costing up to £2 10s., with prepayment meters, should be also supplied and fitted up free of charge; (3) that cookers costing from £2 10s. to £4, with prepayment meters, should be supplied and fitted up at an annual charge of 3s.; (4) that cookers costing from £4 to £5 10s., with prepayment meters, be supplied and fitted up at an annual charge of 6s.; (5) that all cookers costing more than £5 10s., with or without prepayment meters, be supplied and fitted up at an annual charge of 10 per cent. on the list price of the cooker; (6) that all rentals for cookers costing more than £2 10s. be paid in three equal instalments; and (7) that shilling prepayment meters be supplied, when preferred to penny meters. The adoption of these recommendations was moved by Provost Ballantyne, who supported them on various grounds. There was the prospect of the increased day consumption of gas; the experience of other towns, in which connection Rothesay was mentioned particularly; and the fact that they had capital which was only yielding 2½ per cent., and which might be more profitably invested in cookers and meters. The recommendations were adopted without a vote.

A new method of computing the output of gas by prepayment meters has been invented at Coatbridge. The calculation is made upon the weight of the coins collected. For the past quarter, it is reported, over 2 tons of pence were collected from prepayment meters; and the increase of the output may be reckoned from the statement that in the previous quarter the collection was 1 ton 7 cwt. The demand for gas thus goes on increasing by the aid of prepayment meters.

Two interesting changes are taking place among the ranks of gas managers in Scotland at present. The Corporation of Helensburgh are about to take over the undertaking of the Helensburgh Gas Company, by amicable arrangement; and the Manager of the Company (Mr. William Smith) takes the opportunity of retiring from that office, which he has held for nearly 52 years. Mr. Smith succeeded his father, who was the first Manager at Helensburgh; and thus Mr. Blair is the third Manager appointed since 1844. Mr. Blair, who has been at Haddington for nine years, succeeded Mr. James Robb there, the first Manager of the Haddington Gas Company. Mr. Robb is now living in retirement; being over ninety years of age. He served the Haddington Company for 42 years; and thus Mr. Blair was the second in the post of Manager there. Before his appointment at Haddington, Mr. Blair saw service in several foreign parts. He is a member of a family which has been largely mixed up with questions of gas supply. His grandfather was Manager of the gas-works at Johnstone, near Paisley, as far back as 1818; and his father and five uncles all held high positions in connection with gas making. Mr. Blair is an all-round man—the type of man which is best fitted for the management of a provincial gas-works; and his qualities being known, it is little wonder that he received a unanimous appointment out of 34 applicants. He is to be succeeded at Haddington by his brother, Mr. Peter Blair, who is at present at Blaenau Festiniog.

The "Hamilton Advertiser" of to-day says, under the heading of Motherwell: "We understand that arrangements are well advanced for an important extension of the gas-works. It is the intention of the Company to lay down an ammonia plant for the purpose of dealing with their bye-products. Ground has been feued in the rear of the works for this purpose; and it will also provide for any future extension that may be found necessary. Mr. Fullerton has been appointed to the management of the outdoor department; and Mr. Francis Leckie, the Secretary, has taken up the duties of Works Manager."

It is reported that the Lanemark Coal Company, Limited, of New Cumnock, Ayrshire, have sunk a new shaft; and that, at a depth of 18 fathoms, they have struck the upper seam of gas coal. The seam is over 5 feet in thickness; and the coal is of excellent quality, and is believed to be superior to anything the Company have yet worked. In the course of the next few months, at least other three seams will be got.

Gas-mains of large dimensions are at present being laid in Glasgow. From the Dawsholm Gas-Works a line of mains 48 inches in diameter is being laid to Great Western Road; and another main, 36 inches in diameter, is being laid townwards as far as Hyndland. The new bridge at Broomielaw, Glasgow, which has been building during the past three years on the site of a bridge which was taken down on account of increasing instability, is nearing completion. The work now in progress is the laying of mains for the conveyance of gas, water, and electricity, for all of which abundant provision has been made, not only for present, but for future requirements.

I cull the following, relating to Perth, from a local newspaper: "A special meeting of the Perth Gas Commission in Committee was held yesterday—Lord Provost Dewar presiding—to consider the present position of the Commission in regard to the proposed new works. The members of the Commission have been complaining for some time of the delay in the preparation of the plans; and at the meeting yesterday it was reported that Mr. Wilson, the Manager, stated that, while the plans were so far advanced, he had not been at all well recently, and that he could not see his way to have them proceeded with more expeditiously without further assistance. After consideration, it was agreed to relieve Mr. Wilson of the work, and arrange with an independent engineer to complete the plans and superintend the erection of the works."

The Directors of the Gas, Water, and General Investment Trust, Limited, recommend dividends at the rate of 4½ per cent. per annum on the preferred stock, and 3 per cent. per annum on the deferred stock, for the half year ended Jan. 28.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, M.E., Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

London Offices: 19, ABINGDON STREET, WESTMINSTER, S.W.
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CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cubic Feet Daily.
BLACKBURN	1,250,000
WINDSOR STREET WORKS, BIRMINGHAM	2,000,000
SALTLEY WORKS, BIRMINGHAM	2,000,000
COLCHESTER	300,000
BIRKENHEAD	2,250,000
SWINDON (New Swindon Gas Co.)	120,000
SALTLEY WORKS, BIRMINGHAM (Second Contract)	2,000,000
WINDSOR STREET WORKS, BIRMINGHAM (Second Contract)	2,000,000
HALIFAX	1,000,000
TORONTO	250,000
OTTAWA	250,000
LINDSAY (Remodelled)	125,000
MONTREAL	500,000
TORONTO (2nd Cont.; Remodelled)	2,000,000
BELLEVILLE	250,000
OTTAWA (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000
ST. CATHERINES (Remodelled)	250,000
KINGSTON, PA.	125,000
PETERBOROUGH, ONT.	250,000
WILKESBARRE, PA.	750,000
ST. CATHERINES (Second Contract)	250,000
BUFFALO, N.Y.	2,000,000
WINNIPEG, MAN.	500,000
COLCHESTER (Second Contract)	300,000
YORK	750,000
ROCHESTER	500,000
KINGSTON, ONT.,	300,000
CRYSTAL PALACE DISTRICT	2,000,000
DULUTH, MINN.	300,000
CATERHAM	150,000

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *March* 11.

Sulphate of Ammonia.—The market has been very firm at all points; and there has been further improvement in values—the closing quotations being £10 8s. 9d. to £10 11s. 3d. per ton, delivered f.o.b. at the ports. The attention of buyers has been mainly directed to prompt and March deliveries; but considerable purchases have also been made from the larger producers for early April delivery, at about the parity of spot values. Current production has been absorbed as it has become available; and scarcity of supplies alone has prevented a larger business for immediate delivery. The leading feature in the export business has for months past been the sustained demand for Spain. France, Germany, and Belgium have been mainly engaged in receiving deliveries on contracts. Following the policy of last spring, they have been very quiet in regard to further purchasing; and, so far, the improvement in nitrate of soda has not seriously disturbed them. Exports are up to those for January-February, 1898; the shrinkage in January having been made up by larger shipments in February. There are no stocks anywhere; and any increase in production has been absorbed by home demand, which, during the past fortnight, has been quite exceptional all over the country. The forward position is still neglected by consumers; but purchases—understood to be speculative—have been made for April-September delivery at £10 5s. per ton f.o.b. Leith, ordinary terms. London (Beckton terms), April-June delivery, is quoted £10 5s. per ton.

Nitrate of Soda is very firm on spot, off coast, and near at hand; spot quotations being 8s. per cwt. ordinary, and 8s. 3d. refined, quality.

LONDON, *March* 11.

Tar Products.—A fairly firm market at former quotations is the order of the day. An excellent business is being done in creosote and other tar oils. Benzol is as flat as ditch water, and absolutely unsaleable for prompt delivery. The market price is again lower in all grades. Solvent naphtha is in moderate request; while heavy naphtha is slightly dearer. Carbolic acid is steady, with a good inquiry for forward delivery. A little more life is again noted in anthracene; and distillers are hopeful of better business obtaining, though most small producers have for some time ceased making it at all.

Prices are as follows: Tar, 13s. to 19s. Pitch, east coast, 25s.; west coast, 23s. Benzol, 90's, 7½d.; 50's, 8d. Toluol, 1s. Solvent naphtha, 1s. 1d. Heavy naphtha, 1s. 2½d. Crude 30 per cent. naphtha, 3½d. Creosote, 3½d. Heavy oils, 52s. 6d. Carbolic acid, 60's, 2s.; 75's, 2s. 6d. Creosote salts, 40s. Anthracene, "A," 4d.; "B," 3d.

Sulphate of Ammonia.—A capital demand has set in for spring delivery. Large business is being done; and the home market looks like being the best that has ever been known for this article. This is due to the action of the Sulphate of Ammonia Committee, who have made agriculturists in this country alive to the great value of sulphate as a nitrogenous manure. Makers are holding for £10 10s. in all positions, while buyers are bidding £10 7s. 6d. to £10 8s. 9d., in each case less 3½ per cent.

COAL TRADE REPORTS.

From Our Own Correspondent.

Lancashire Coal Trade.—The talk of upward movements in prices of one sort or another during the ensuing contract season becomes more prevalent in the coal trade of this district; and one leading representative stated on 'Change last week that it was more than probable there would be some further official advance with the close of the present month. He also added that various steps were being taken to bring about a general co-operation of colliery proprietors in the different districts, with regard to not only maintaining prices, but establishing the advance to which they considered themselves entitled under present conditions. Yesterday (Monday) a private meeting of Lancashire colliery owners was held at Liverpool to consider specially the basis on which quotations should be made for the locomotive fuel and shipping contracts over the ensuing year; and although no official information is at present available as to the result of this meeting, it is generally understood that the basis would be advanced 1s. to 1s. 6d. per ton over last year's prices. With regard to gas coal contracts, though this was not one of the questions specially considered at the Liverpool meeting, it is stated in well-informed quarters that it is the intention of Lancashire collieries to co-operate with those in Yorkshire, who in many cases have already taken the definite step of informing their agents that when inquiries come forward as to gas coal contracts, the quotations are to be based on an advance of 1s. 6d. per ton over the prices taken last season. So far as the engine fuel contracts are concerned, many of the leading collieries are taking up a stronger position than last week seemed probable. Though buyers for the most part are declining to place new contracts at any material advance upon the full current rates, and they are limiting their purchases to hand-to-mouth requirements at present prices, there is a growing disinclination on the part of coalowners to contract themselves forward, unless they can do so at some substantial advance over the rates now ruling. Certainly the whole tendency of prices is in a strong hardening direction; and if colliery proprietors can bring about an effective combination in the various districts on the question of prices, their position will necessarily be very materially strengthened in holding out for higher rates. As to the general trade of the district, the only change to notice is some slight falling off in house-fire qualities. For all other qualities of fuel requirements are fully maintained, and prices exceedingly strong. Ordinary steam and forge coals are readily fetching 8s. 6d. to 9s. per ton, with a tendency to harden on forward sales. Engine fuel is quoted at 4s. 9d. to 5s. per ton at the pit for common, 5s. 3d. to 5s. 9d. medium, and 6s. 3d. to 6s. 9d. for best sorts. These prices are, however, confined to current sales, Shipping is fairly good, with ordinary steam coals realizing 9s. 3d. to 9s. 6d. per ton delivered at Garston Docks, 9s. 9d. to 10s. at the High Level, Liverpool, and about 10s. at the Partington tips of the Ship Canal.

Northern Coal Trade.—The coal trade of this district is fairly brisk; but there is not quite so full a demand for gas coal as there was. Best Northumbrian steam coals are steady at 11s. per ton f.o.b.; but for delivery over the season, the quotation is about 11s. 6d. per ton for best,

LATEST DEVELOPMENT
IN
GAS-COOKERS

WRIGHT'S PATENT,
BY WHICH ALL THE
ADVANTAGES OF LOOSE BURNERS
ARE OBTAINED
WITHOUT
ANY OF THE DISADVANTAGES.

NO EXTRA CHARGE IS MADE
FOR THESE IMPROVEMENTS.

JOHN WRIGHT & CO. LIMITED,
LONDON & BIRMINGHAM.

10s. 6d. for seconds, and 6s. for steam smalls. In gas coals, the quotation is about 8s. 6d. per ton f.o.b. for occasional cargoes. Some of the contracts of the large gas companies are now being arranged; and it seems probable that the average price will not be much under or over 8s. per ton f.o.b. It is reported that the South Metropolitan Gas Company have secured nearly 25 per cent. of their requirements at less than this price. There is no change in the position of the manufacturing coal trade. Prices of gas coke show no alteration this week.

Scotch Coal Trade.—The high prices which have been prevailing of late have had the effect of reducing the demand for shipping; and the consequence has been a more plenteous supply of coal for the home market, and lower prices. The masters' and men's representatives were in conference in Glasgow on Friday; but, on the plea of want of plenary powers, the meeting was adjourned till yesterday (Monday). If an advance is not given, the miners in Fifeshire are prepared to strike on Wednesday (to-morrow). The situation is a delicate one; but the lowering of prices in face of the possibility of a strike, lends colour to the view that coal merchants expect there will be no stoppage. The prices quoted are: Main, 9s. 6d. to 9s. 9d. per ton f.o.b. Glasgow, ell 10s. to 10s. 6d., and splint 10s. 6d. to 10s. 9d. The shipments for the week amounted to 130,389 tons—a decrease of 8845 tons upon the preceding week, and of 1922 tons upon the corresponding week of last year. For the year to date, the total shipments have been 1,240,592 tons—an increase of 83,147 tons upon the same period of last year.

Self-Lighting Gas Apparatus Company.—At the first annual general meeting of the German Self-Lighting Gas Apparatus Company, Limited, lately held in Berlin, the Chairman (Dr. Loewy), in the course of a report on the past twelve months' business, stated that the apparatus had been thoroughly approved, and the technical difficulties removed. The sale in Germany had been made over to two Companies, and had been very satisfactorily developed; 6000 appliances being disposed of in the month of January alone. The English patent rights had been sold for 1,000,000 marks; and a Syndicate had been formed for floating the Company to work the business. The disposal of the patent rights in America was under negotiation; and the Directors hoped by the sale to secure for the Company 1,500,000 marks.

Opposition to the Redditch Gas Company's Bill Withdrawn.—At a special meeting of the Redditch District Council last Friday, the Lighting Committee presented a report recommending the withdrawal of opposition to the Bill now being promoted by the Gas Company. The Clerk explained that, at a conference with the Directors of the Company, the latter made it clear that the Council could not obtain any concession respecting the purchase of the undertaking; and they would not grant any concession at all if this point was persisted in. They also declined to reduce their standard rate from 4s. 6d., which they had secured under an Order of 1882. They, however, agreed to raise the illuminating power from 14 to 15 candles; and to increase the area within which the standard price of 4s. 6d. would be charged from within a mile of the works to the whole of the urban district. The report was adopted.

The Water Supply of Holbeck and New Wortley.—The Leeds Corporation Water Committee are proposing to improve the water supply of Holbeck and Wortley by laying a new 18-inch main, at a cost of £5400. It will be capable of carrying a supply of 3 million gallons per day.

The Bootle Corporation and Water Gas.—Mr. G. Lamb made an inquiry, at the meeting of the Bootle Town Council last Wednesday, as to whether there was any way of preventing carburetted water gas being supplied by the Liverpool United Gas Company in the area of the borough. The Town Clerk replied, and said the Council ought to make strenuous exertions, and put pressure upon the Company, by combining with public opinion and pressing the Home Secretary to give effect to the recommendation of his own Committee by introducing a Bill.

The Newtown and Llanllwchaiarn Gas Company's Provisional Order.—Application was recently made to the Board of Trade by the above-named Company for a Provisional Order to sanction original capital to the amount of £15,000, additional capital to the extent of £10,000, and a standard price of 5s. The application was opposed by the District Council, who were desirous of having a purchase clause inserted in the Order. No decision was come to on this point; but the price was reduced to 4s. 7d., subject to revision by the Board, the additional capital to £6000, and the money raised on loan from £2500 to £1250.

Serious Charge against a Sheffield Accountant.—Robert Kershaw, a Sheffield accountant, and formerly Chief Accountant of the Sheffield Gas Company, was taken into custody last Sunday evening on a charge of shooting his daughter Agnes, who is well known in Sheffield as a leading and most prominent student of the Sheffield School of Art, and was regarded by her tutors as an artist with a good career before her. Her father some years ago visited India, where he had a sunstroke; and it is supposed that this and his general habits may have affected his mind. He had an illusion that his daughter's career as an artist was immoral.

The Richmond "Kitchener" Competition.—By an announcement which appears elsewhere, it will be seen that Mr. A. M. Archer, jun., of the Bridlington Quay Gas-Works, will have the pleasure of spending a week at Lucerne next Easter, if he feels so disposed; he having secured the prize offered by Messrs. Richmond and Co., Limited, in connection with the above-named competition. Out of the many hundred guesses at the right word, which was "Nihil," only two were correct—Mr. Archer's and one by Mr. J. Gibson, of Hornsey; and as Mr. Archer's form was the first taken from the hamper, he wins the prize. But his fellow-competitor will also receive an award.

The Stretford Gas Bill and the District Council.—The Stretford District Council last Tuesday adopted a report of the General Purposes Committee, who, having considered the local Gas Company's Bill, recommended the acceptance of the following (among other) concessions offered by the Company: The withdrawal of the clauses relating to the manufacture of residuals on the land to be acquired under the Bill; the reduction of the insurance fund from 5 to 2 per cent.; and the insertion of a clause prescribing a minimum of 15-candle power in the quality of gas manufactured. The legal advisers of the Council have been instructed to take steps to ensure the carrying out of these concessions.

CRANBROOK DISTRICT WATER COMPANY,

(CRANBROOK DISTRICT WATER ACT, 1898.)

Particulars and Conditions of SALE by TENDER of 10,011 ORDINARY SHARES of £1 each (ranking for Dividend up to Seven per cent.), and 9382 PREFERENCE SHARES of £1 each (carrying Dividends at Five per cent. per annum, Being the Balance of the Additional Capital of £36,000 authorized by the Company's 1898 Act).

BANKERS:

The London and County Banking Company, Ltd., Cranbrook; Head Office, 21, Lombard Street, London, E.C., and Branches.

Terms of Payment: On Application, 10 per cent.
" " " 14th April, 30 per cent.

Terms of Payment: On 14th May, 30 per cent.
" " " 14th June, 30 per cent.

The Directors of the CRANBROOK DISTRICT WATER COMPANY Hereby give Notice, that they will be prepared to RECEIVE at the Company's Office, 4, Tokenhouse Buildings, Bank, London, E.C., on Wednesday, the 8th day of March, SEALED TENDERS for 10,011 ORDINARY SHARES of £1 each (ranking for Dividend up to Seven per cent.), and 9382 PREFERENCE SHARES of £1 each (carrying Dividends at Five per cent.). The List will be closed on Tuesday, the 14th day of March.

The Issue of Capital is required for completing the new Works, which are now being actively proceeded with and authorized under Section 7 of the Cranbrook District Water Act, 1898 (coloured plan showing the Company's areas of supply accompanies the Prospectus). The extension of the limits of supply under Section 4 are:—

"Subject to the provisions of this Act, the Company may, in addition to the parishes and places which they are by the Act of 1895 authorized to supply with water, supply water to and within the following parishes and places—namely, the Parishes of Benenden, Frittenden Biddenden, High Halden, the Parish and Borough of Tenterden, the Parishes of Rolvenden, Sandhurst, Newenden, Woodchurch, Wittersham, and Stone-cum-Ebony, in the County of Kent, and Northiam and Beckley, in the County of Sussex."

Under the Company's Act of 1895:—

"The limits of this Act for the supply of water hereinafter referred to as 'the limits of this Act or the District' shall be the Parishes of Cranbrook, Goudhurst, and Hawkhurst, in the County of Kent."

The Company are now supplying Cranbrook and Hawkhurst with Water; and the Goudhurst Services are being proceeded with. The Company will supply the Corporation of Tenterden and other Districts *en route* in about three Months. Mains have already been laid in the principal streets of Tenterden. The works were officially opened by the Right Honourable the Earl of Cranbrook, P.C., G.C.S.I., D.C.L., LL.D., on the 3rd of August last, and in so doing his Lordship stated: "It would be a great boon now that the district would have a bountiful supply of pure water, which was so important to their health." The demand for water is so great in some of the Company's area of supply that at a meeting of the Town Council of Tenterden the Town Clerk was instructed to write the Company that "The Borough is without Water for Fire Extinction, Drain Flushing, and Street Watering, to say nothing of the needs of Private Consumers." The Company's existing Reservoir will supply by gravitation the whole of the new authorized area with Water, the present supplies for which are sufficient, and certified as being of excellent quality.

A Report of the General Meeting of the Company, held at the Westminster Palace Hotel, on the 7th day of February, and a reprint of a recent article on the Company, published in the "Sussex Daily News," are enclosed with Prospectus. At the Meeting the Directors had the pleasure of reporting to the Shareholders that the Revenue for the first Five Months, after the opening of the Works, had been very satisfactory, and had enabled them to pay the London and Local Management expenses, also the Debenture Interest, and carry forward a Balance. As an illustration of the value of Local Investments, it may be mentioned that the premiums received on the Company's issues of Capital amounted to £1442 6s. 6d., and that at a recent Sale of Cranbrook Gas Company's Shares of £10 each the same realized £18 10s. per Share, or a premium of 85 per cent.

By order,
L. H. DEROUET,
Secretary.

CRANBROOK DISTRICT WATER COMPANY,
4, *Tokenhouse Buildings, E.C.*
Dated the 8th day of March, 1899.

SALE BY TENDER

Of 10,011 ORDINARY SHARES of £1 each, ranking for Dividend up to 7 per cent., and 9382 PREFERENCE SHARES of £1 each, carrying Dividends at the rate of 5 per cent. per annum, being the Balance of the Additional Capital of £36,000 authorized to be issued under the Cranbrook District Water Act, 1898.

This Form of Tender may be used.

To the Directors of the CRANBROOK DISTRICT WATER COMPANY.

Gentlemen,—.....hereby tender for..... Ordinary Shares of £1 each, ranking for dividend up to Seven per cent., and for.....Five per Cent. Preference Shares of £1 each, in the Cranbrook District Water Company, in accordance with the above Act, Prospectus, dated 8th March, 1899, and the conditions annexed, and.....offer the sum of..... Pounds.....Shillings (£.....s.....) for every Ordinary Share, and.....Pounds .....Shillings (£.....s.....) for every Preference Share, and agree to accept the same or any lesser number that may be allotted to..... .....herewith enclose £.....s.....d..... being 10 per cent. on the Shares above tendered for, and.....undertake to pay the balance due on such Shares, or on so many thereof as may be allotted to..... in accordance with the terms of the said conditions.

Name in full.....
Address.....
Description.....
Date.....

Sealed Tenders, with the 10 per cent. deposit, should be delivered, addressed to the Secretary, at the Company's Office, 4, Tokenhouse Buildings, Bank, London, E.C., marked "Tender for Cranbrook District Water Company Shares." The list will close on Tuesday, March 14. Cheques should be made payable to the order of the "Cranbrook District Water Company," and crossed "London and County Banking Company, Limited, Cranbrook."

The cooking on the new corridor trains of the Great Central Railway is done by one of Messrs. Fletcher, Russell, and Co.'s gas-ranges.

The Birmingham Corporation are going to spend £4000 in providing additional water-mains in the centre of the city for fire purposes.

The Hereford Corporation Water Committee have received the sanction of the Local Government Board to borrow £500 for the purchase of the land required for the new filter-beds, and £2500 for their construction. The former amount is repayable in 15 years, the latter in 28 years.

In obtaining their Water Act last session and opposing the Rochdale Corporation Water Bill, the Todmorden Corporation incurred costs amounting to £4500. In proportion to the rateable value, this is stated to be considerably heavier than the costs of the Rochdale Corporation.

We have received from Messrs. George M. Callender and Co., of No. 11, Victoria Street, S.W., a copy of the very effective trade list they have just issued, giving the names of the places where their pure bitumen damp-course has been used, and a large number of well-executed views of buildings in which it has been employed throughout.

Owing to the development of the acetylene gas business carried on by Messrs. Read Holliday and Sons, Limited, of Huddersfield, it has been found necessary to form a separate Company to deal with it. This branch of the business will therefore in future be conducted by the Read-Holliday Acetylene Company, Turnbridge, Huddersfield.

Messrs. Joseph Taylor and Co., of Bolton, have recently received the following orders for their latest make of solid-plate lead saturators: Peterborough Gas Company, Harrow and Stanmore Gas Company, Leigh Urban District Council (saturator and sulphate drainer); also from Messrs. Newton, Chambers, and Co. for their Rockingham Gas-Works.

Messrs. Newton, Chambers, and Co., Limited, have secured No. 2 contract in connection with the extensions and improvements at the gas-works of the Ashford District Council. The price is £6620 10s.; and, according to the advertisement which recently appeared in the "JOURNAL," the contract comprises the supply and erection of purifiers, a telescopic holder, retort-fittings, boilers, wrought-iron roofs, and other works.

The Economical Gas Apparatus Construction Company, Limited (Merrifield-Westcott-Pearson patents), in addition to the work they have in hand for the Crystal Palace District Gas Company, Caterham, and other places in England, have received orders for work of various descriptions in America, having recently been appointed Consulting Engineers to the Buffalo Corporation, for whom they are getting out plans and specifications for a complete municipal plant. They also recently received orders to put in carburetted water-gas plant at Kingston, Canada, and similar plant for the Duluth Corporation, Minnesota; also an order from the Consumers' Gas Company of Toronto to supply them with four large purifying boxes, complete lifting apparatus, two hydraulic lifts, and large condensing plant.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.
JOHN WM. O'NEILL, Managing Director,
160, 161, & 162, PALMERSTON BUILDINGS,
OLD BROAD STREET,
LONDON, E.C.

ANDREW STEPHENSON, AGENT. All communications re Oxide to the Company as above.

WINKELMANN'S "VOLCANIC" and "VOLCUM" CEMENT. Fire Resistance up to 4500° Fahr. In use in Gas-Works all over the World.
ANDREW STEPHENSON,
182, PALMERSTON BUILDINGS,
OLD BROAD STREET,
LONDON, E.C.
Telegrams: "*Volcanism, London.*"

BROTHERTON & CO.
Offices: Commercial Buildings, LEEDS. Correspondence invited.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER LINCOLN."
[For Illustrated Advertisement, see March 7, p. 622.]

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

SULPHURIC ACID for Sale.
BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1769.

PATENTS FOR INVENTIONS.
Messrs. J. C. CHAPMAN & CO., Chartered Patent Agents, ADVISE ON ALL MATTERS CONNECTED WITH ABOVE.
Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

IMPORTANT.

REPAIR your old Retorts with Patent STICKFAST FIRE CEMENT. Unequalled for Repairing Inclines. Estimates for all kinds of Retort-Settings.
Write CROWTHER, Retort Setter, and Sole Maker of Stickfast Fire Cement, Manor Street, HUDDERSFIELD.

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, NEWTON GRANGE, NEWBATTLE, DALKEITH, } SCOTLAND.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM; and 45 & 47, Westminster Bridge Road, LONDON, S.E.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

SADLER & CO., Ld., Middlesbrough; ULVERSTON (BARROW); PORTSMOUTH; CARLTON (N.E.R.); and STOCKTON. Tar and Petroleum Distillers. Benzol and Petroleum Spirit, 700 and other Gravities specially prepared for Carburetting. SOLAR OIL for Gas Making, Kerosene, &c.
Correspondence invited.
Telegraphic Address: "SADLER, MIDDLESBROUGH."

GAS TAR wanted.
BROTHERTON AND CO., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special attention to Repairs.
Before placing Orders, please write for Estimate.
Telegraphic Address: "SATURATORS, BOLTON."

AMMONIACAL LIQUOR wanted.
BROTHERTON AND CO., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS CARBON Wanted, not less than 4-Ton Loads.
Apply to the BRIMINGTON CARBON COMPANY, Bowerby Bridge, YORKS.

ECONOMY IN PURIFICATION.

INCREASE the efficiency of your PURIFIERS by adopting CRIPPS'S PATENT BYE-PASS VALVE in the lower Tiers of Sieves. Practical Experience proves their Economy. Engineers are repeating orders after thorough trial.
References and Particulars can be obtained from the Makers—
C. & W. WALKER, Midland Iron-Works, Donnington, near Newport, SALOP.

SPENT OXIDE wanted.
BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

WANTED 6000 TONS OF GAS COKE.

MESSRS. PHILLIPS & CO., LTD., request from Country Gas Companies TENDERS for the supply of 6000 Tons of GAS COKE, delivered into Trucks in about equal monthly quantities over the next Twelve Months.
For further Particulars, apply to 25, COAL EXCHANGE, E.C.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality. SPECIAL FIRE CEMENT, OXIDE PAINTS, OILS, SULPHURIC ACID, &c.
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

TO GAS AND WATER OFFICIALS.

CYCLES of the Highest Quality at reasonable Prices. Catalogue, post free. For CASH, or on GRADUAL PAYMENT SYSTEM. *Sent on approval. Twelve Months' Guarantee.*
MELROSE CYCLE COMPANY, COVENTRY.

PRACTICAL RETORT SETTER.

GEORGE NUTTALL, 32, Havelock Road, Saltley, Birmingham.
Regenerator or other Furnaces erected to Engineers' own Designs. Best Work Guaranteed. Please write for Estimates.

WANTED, a Situation by a young Man as METER INSPECTOR and GAS-FITTER. Can fix Meters and Stoves. Well up in Iron and Compo. Age 22. Testimonials to be had.
Apply to W. K., care of Mr. H. Keirman, Manager, Gas-Works, THORNEY, near PETERBOROUGH.

YOUNG Man (Age 27) wants Situation as MANAGER or SECRETARY (or both combined) of a medium-sized Gas or Water Works, or ASSISTANT in a large Works. Thirteen Years' experience; last Five Years as Assistant Manager and Secretary of a medium-sized Works.
Address No. 3224, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS Manager required immediately for the Holsworthy Gas-Works.
Apply to the SECRETARY.

GAS-STOVES.

WANTED, a good Traveller, to take charge of Midlands and South Grounds.
Apply to CHAS. WILSON AND SONS, Armley, LEEDS.

WANTED, by a Merchant Firm, a TRAVELLER in Gas Coal and Cannel. Good Salary and Expenses.
Address No. 3211, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS-FITTER wanted, experienced in Public Street Lighting, fitting up Incandescent Burners, &c.
Apply, by letter only, to S. PONTIFEX AND CO., 22, Coleman Street, LONDON.

WANTED, Two Main and Service LAYERS; also GAS-FITTER. Must be steady and thoroughly reliable Men.
Apply, by letter, stating Wages required, with other Particulars, to No. 3228, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS-FITTERS AND WATER-FITTERS.

WANTED, Two or Three good Hands for Gas and Water Company's Fittings Department.
Applications, in own handwriting, with full particulars of Age, Experience, and Wages expected, to No. 3229, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS-FITTER wanted, used to Internal Work—Iron, Compo., Ordinary and Prepayment Meters and Fittings, and the Incandescent Burner. Wages 27s.
Applications, stating Age, Experience, with *copies* only of Testimonials, and when at liberty, to be sent to the MANAGER, Gas-Works, NEWMARKET.

WANTED, a Representative for England, with good connection among Gas-Works, &c., for Advertiser's Scrubber-Washers and Purifiers.
Apply, with full Particulars, to Mr. ZSCHOCKE, Engineer, Kaiserslautern, GERMANY.

COAL and Cannel Merchants want first-class TRAVELLER. Good Salary and Expenses.
Address, in confidence, giving full Particulars of ground covered, &c., No. 3225, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, for Chemical Works, a CHEMIST (not under 30) to take charge of the Chemical Department. Must have had practical Experience in dealing with Tar Colours.
Applications (confidential), by letter, to No. 3226, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, two Carbonizing Foremen, accustomed to Regenerative Furnaces and Inclined Retorts.
Apply, by letter, enclosing *copies* of three recent Testimonials as to Character and Abilities, to No. 3227, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GUILDFORD GASLIGHT AND COKE COMPANY.

WANTED, immediately, a Practical Man to work Schwab's Sulphate Plant and make himself useful in Gas-Works. Wages 30s. per week.
Apply at once with two recent Testimonials.
WILLIAM TITLEY,
Secretary.
Gas Offices, Guildford,
March 4, 1899.

RICHMOND GAS COMPANY.

WANTED, a Clerk, over 25 years of age, with a good knowledge of Gas Companies' Accounts, to act as CASHIER.
Salary £120 per annum, with an annual advance of £10 to a maximum of £200 per annum.
Applications, stating Age and Experience, with *copies* of not more than three recent Testimonials (which will not be returned), to be sent to the undersigned by Saturday, the 18th inst.
THOMAS MAY,
Secretary.
Gas Offices: The Green, Richmond,
Surrey, March 10, 1899.

FOR SALE—A pair of Valves for Inlet and Outlet Pipes, 10-inch and 12-inch (only used once), by Donkin and Co.
For further Particulars, apply to the SECRETARY, Gas Company, NEWARK.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

FOR SALE, cheap—
Two PURIFIERS, 8 ft. square by 4 ft. deep.
Two " 5 ft. " 4 ft. "
One " 5 ft. " 3 ft. "
One EXHAUSTER, 20,000 Cubic Feet per hour.
Two " 5000 " "
Also CONDENSERS, SCRUBBERS, WASHERS, GASHOLDERS and TANKS, VALVES, &c., &c.
Apply to SAML. WHILE AND SON, 60, Queen Victoria Street, LONDON, E.C.

GAS Plant for Sale, cheap to clear—
RETORT IRONWORK, several good Sets.
Six-inch VERTICAL PIPE CONDENSER complete.
Four ANNULAR CONDENSERS, 32 in. by 18 ft.
EXHAUSTERS and ENGINES, several good Sets.
TOWER SCRUBBERS, 5ft. by 20ft., 5ft. by 40ft., & others.
PURIFIERS from 5 ft. square to 12 ft. square.
STATION METERS and GOVERNORS.
GASHOLDERS, 35 ft. by 14 ft. & 50 ft. by 18 ft., perfect.
VALVES of all kinds in Stock.
IRON STORAGE TANKS.
J. FIRTH BLAKELEY & Co., Thornhill, DEWSBURY.

SECOND-HAND GAS PLANT FOR SALE.

ONE Kirkham & Hulett "Standard" WASHER-SCRUBBER, fitted with Wooden Bundles. Capacity 150,000 cubic feet per day, 8-inch Connections diminished to 6-inch with Bye-pass and Valves, Draw-Off Cocks, and Driving Gear. The whole complete, and in thorough working order.
Also One ANDERSON'S COMBINED ENGINE and EXHAUSTER, Capacity 150,000 cubic feet per day, with 6-inch Connections and Bye-Pass; and One DITTO, 300,000 cubic feet Capacity, with 10-inch Connections and Bye-Pass.
For further Particulars, apply to the MANAGER, Gas-Works, NEWMARKET.

GAS-STOVES.

STRONG Cast-Iron Stoves, made double throughout, fitted complete with Taps, with Lever Handles. All of best construction, but not enamelled.
"A" Size—12 in. high, 12 in. wide, 11½ in. deep, 25 in. high overall. Hot plate 16½ in. wide, 11½ in. deep, with Two Ring-Burners. List Price, £4; now offered at £1.
"B" Size—23 in. high, 13 in. wide, 14 in. deep, 32 in. high overall. Hot plate 17½ in. wide, 16 in. deep, with Three Ring-Burners. List Price £5 10s.; now offered at £1 10s.
About Twenty of each size in Stock. Must be cleared owing to our having given up the manufacture of these goods, and space being required. Will accept any reasonable offer.
STRODE & Co., 48, Osnaburgh Street, LONDON, N.W.

GAS-WORKS FOR SALE.

FOR SALE—Two small Gas-Works in Country Towns, together or singly.
For Particulars, apply to EDMUNDSONS, 33, Capel Street, DUBLIN.

FOR SALE.

THE Directors of the Staines and Egham Gas Company have FOR SALE a 10-inch HORIZONTAL CONDENSER, a LIVESEY WASHER, a GOOD'S WASHER, a CAST-IRON SCRUBBER, 8 ft. by 24 ft.—the whole complete, with 10-inch Connections, Valves, &c. They are capable of dealing with 500,000 cubic feet of Gas in 24 hours. All in good condition, and can be removed at once. The whole to be taken down and carted from the Company's Works by the Purchaser.
Tenders for the whole as they stand to be sent to the undersigned.
THOMAS WEBB,
Manager.

BOROUGH OF DARWEN.
(GAS DEPARTMENT.)

TENDERS FOR OXIDE.

THE Corporation are prepared to receive TENDERS for the supply of 350 Tons of OXIDE OF IRON, delivered at their Siding, for Purifying the Gas at their Works.
All Particulars may be obtained on application to Mr. A. H. Smith, Gas Engineer, Darwen.
Sealed Tenders, endorsed "Oxide of Iron," to be delivered to the undersigned, at or before Noon, March 27, 1899.
The lowest or any Tender not necessarily accepted.
By order,
CHAS. COSTEKER,
Town Clerk.
Town Clerk's Office,
Darwen, March 7, 1899.

BOROUGH OF DARWEN.
(GAS DEPARTMENT.)

SPENT OXIDE.

THE Corporation invite Tenders for the purchase of about 520 Tons of SPENT OXIDE.
All Particulars may be obtained on application to Mr. A. H. Smith, Gas Engineer, Darwen.
Sealed Tenders, endorsed "Spent Oxide," to be delivered to the undersigned at or before Noon, March 27, 1899.
The highest or any Tender not necessarily accepted.
By order,
CHAS. COSTEKER,
Town Clerk.
Town Clerk's Office,
Darwen, March 7, 1899.

TENDERS FOR GAS-METERS.

TENDERS wanted for the Supply and Repair of GAS-METERS, including their setting-up and exchange, for the lighting of Copenhagen, Denmark.
Particulars as to Conditions can be obtained every week-day from Ten to Four o'clock, through the Koebenhavn Gasvaerkers Ingenieurkontor, Vestre Gasvaerk, Koebenhavn V.
Tenders, by letter, with the words "Tilbud paa Gasmaalere," should be addressed Magistrats-Kontor, 4, Abthell, Lavendelstraede 1, Copenhagen K, till Wednesday, March 15, 1899, Twelve o'clock at noon.
THE MAGISTRATE OF KOPENHAGEN.
Feb. 17, 1899.

THE Directors of the Romford Gas and Coke Company, Limited, invite TENDERS for the supply of 2000 Tons of best SOUTH YORKSHIRE, SILKSTONE, or other high-class INLAND COAL, and for 2000 Tons of high-class DURHAM GAS COAL, per annum for One or Two Years, dating from the 1st of May next.
Tenders, endorsed "Tender for Coal," and stating Price per Ton of 20 cwt., delivered free at Romford Station, G.E.R., to be sent in on or before March 25, addressed to the Chairman of the Company.
Separate price to be named for each annual quantity.
Deliveries to commence from May 1, as per Schedule to be supplied by the Company.
Payments will only be made on the quantities delivered over the Company's weighbridge.
The Directors do not bind themselves to accept the lowest or any Tender.
By order,
HY. JOHNSON,
Secretary.
March 11, 1899.

SHEFFIELD UNITED GASLIGHT COMPANY.

ELEVATED TRAMWAY AND COKE-STORE.
TO ROOF AND GIRDER MANUFACTURERS, CONTRACTORS, &c.

THE Directors of this Company invite TENDERS for the supply and erection of CORRUGATED-IRON ROOFS, with Columns, Girders, and Cast-Iron Guttering, and for ELEVATED TRAMWAY for their Grimesthorpe Station.
The Roofing is 96 feet long by 88 feet span, and the Elevated Tramway 650 feet long.
Drawings may be seen, and Specification with Bill of Quantities and Form of Tender obtained, on application to the Engineer, Mr. Fletcher W. Stevenson, on payment of 10s. 6d., which will be returned on receipt of a *bonâ-fide* Tender.
Sealed Tender, endorsed "Tender for Coke-Store," must be delivered by post to the undersigned at the Company's Offices not later than the first post on Saturday, the 18th day of March next.
The Directors do not bind themselves to accept the lowest or any Tender.
HANBURY THOMAS,
General Manager and Secretary.
Commercial Street, Sheffield,
March 2, 1899.

EAST RETFORD CORPORATION.

THE Gas Committee of the above Corporation are open to receive TENDERS for the supply of 6000 Tons of best Screened GAS COAL or NUTS during the Year ending March 31, 1900.
Tenders to be sent in to the undersigned, endorsed "Tender for Coal," on or before the 18th inst.
Forms of Tender not supplied.
J. B. FENWICK,
Engineer and Manager.
March 7, 1899.

LANCASTER CORPORATION GAS-WORKS.

THE Lancaster Corporation Gas Committee invite TENDERS for the purchase of about 250 Tons of SPENT PURIFYING MATERIAL, delivered on rails, Lancaster.
Samples of the Spent Material may be obtained on application to the undersigned, from whom any further Information may be obtained.
Sealed Tenders, endorsed "Tender for Spent Purifying Material," to be delivered to T. C. Hughes, Esq., Town Clerk, Lancaster, not later than Saturday March 18 next.
C. ARMITAGE,
Manager.
March 4, 1899.

TENDERS FOR TAR.

THE Directors of the Exeter Gaslight and Coke Company invite TENDERS for their surplus TAR for Six Months from Ladyday next; the Company to have the option to extend same a further Six Months.
Delivery on Company's Works, filled into Purchaser's Tanks.
Payments, cash monthly.
Sealed Tenders, endorsed "Tender for Tar," will be received by the undersigned on or before Saturday, the 25th of March next; but the Directors do not bind themselves to accept the highest or any Tender.
By order,
W. A. PADFIELD,
Secretary.
Gas Offices: 11 & 12, East Southernhay,
Exeter, March 1, 1899.

URBAN DISTRICT COUNCIL OF NEWTON-IN-MAKERFIELD.

TENDERS FOR CONDENSERS AND EXHAUSTER.

THE above Council invite Tenders for the supply and erection of CONDENSERS and EXHAUSTER at their Gas-Works (Earlestown, L. & N.W. Railway).
Further Particulars and Forms of Tender may be obtained upon application to Mr. A. Bowes, Assoc.M. Inst.C.E., Town Hall, Earlestown.
Tenders, endorsed "Condensers" or "Exhauster," to be forwarded to the undersigned not later than Saturday, the 18th of March, 1899.
The lowest or any Tender not necessarily accepted.
W. W. SHIRLEY,
Clerk to the Council.
Town Hall, Earlestown,
Lancashire, March 1, 1899.

TOWN AND COUNTY OF POOLE GAS AND COKE COMPANY, LIMITED.

THE Directors of the above Company hereby invite TENDERS for the supply and delivery at the Gas Quay or the Railway Station, Poole, of the following quantities of TURNED and BORED SPIGOT and SOCKET CAST-IRON PIPES—

	Each.	Cwt.	qr.	lbs.			
400	5 in.	1	3	9,	and 9 ft.	Exclusive of Socket.	
1000	4 in.	1	1	9,	" 9 ft.	"	"
1000	3 in.		3	23,	" 9 ft.	"	"
600	2 in.		1	13,	" 6 ft.	"	"

Also a quantity of SPECIAL CASTINGS for the various sizes. The whole to be supplied in accordance with the Specification, which may be seen at the said Company's Offices, Gas Quay, Poole.
Tenders, sealed and endorsed "Tender for Pipes," must be delivered to the undersigned on or before Monday, the 27th inst.
The said Directors do not bind themselves to accept the lowest or any Tender.
By order,
WILLIAM DAVIS,
Secretary, &c

SHOEBURYNESS-ON-SEA GAS COMPANY, LIMITED.

CONTRACT No. 4.
TO IRONWORK CONTRACTORS.

THE Directors of the Shoeburyness-on-Sea Gas Company, Limited, are prepared to receive TENDERS for
RETORT-HOUSE ROOF,
RETORT-MOUNTINGS,
WROUGHT-IRON CONDENSER,
COMBINED WASHER AND SCRUBBER,
PURIFIERS,
GASHOLDER, and OTHER WORK.
Copies of Specification, with Blue Prints, may be obtained on or after Friday, March 17, at the Offices of the Company, Shoeburyness, or from Mr. Henry J. Robus, the Company's Consulting Engineer, 20, Bucklersbury, London, E.C., on payment of Two Guineas, which will be returned upon the receipt of *bonâ-fide* Tender.
Plans and Specifications may be seen, and Particulars taken, between the hours of Ten and Four at the Engineer's Offices.
Sealed Tenders (on the forms supplied) to be delivered at the Company's Offices not later than Twelve noon, on Monday, March 27, 1899, endorsed "Tenders for New Gas-Works," and addressed to the Chairman, Gas Offices, Shoeburyness-on-Sea, Essex.
The Directors do not bind themselves to accept the lowest or any Tender.
HENRY J. ROBUS,
Engineer to the Company.

TENDERS FOR GAS COAL.

THE Corporation Gas Committee of Stoke-upon-Trent invite TENDERS for the supply of GAS COAL.

Specification and Form of Tender may be obtained on application to the undersigned, or at the Gas Offices.

Tenders to be sent in not later than Twelve o'clock noon, the 16th of March, 1899, addressed F. Geen, Esq., J.P., Chairman of the Gas Committee, Stoke-upon-Trent, and endorsed "Tender for Gas Coal."

WM. PRINCE,
Engineer and Manager.

Gas-Works, Stoke-upon-Trent.

TENDERS FOR GAS-MAINS.

THE Directors of the Slough Gas and Coke Company invite TENDERS for 1540 Yards of 12-inch, 30 Yards of 15 inch, and 170 Yards of 8-inch CAST-IRON MAINS and for SPECIALS at per Ton.

Tenders must specify quality of Metal, Weight, and Testing of Pipes.

Also for LEAD and YARN.

One-half of the Pipes to be delivered by the 31st of May, and the remainder by the 30th of June next.

Any further Particulars may be obtained of Mr. T. Webb, Manager, Gas-Works.

The Directors do not bind themselves to accept the lowest or any Tender.

Tenders to be delivered on or before Tuesday, the 21st inst.

By order,
ARTHUR THOMAS,
Secretary.

High Street, Slough,
March 11, 1899.

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 22nd inst., at Half-past Twelve o'clock precisely, to transact the usual Business, and to declare the Dividend for the Half Year ended the 31st of December last.

Notice is Hereby also Given, that the TRANSFER BOOKS of the Company WILL BE CLOSED on the 11th, and RE-OPENED on the 23rd inst.

By order of the Court of Directors,
H. B. CHAMBERLAIN,
Secretary.

Chief Office: No. 11, George Yard,
Lombard Street, London, E.C.,
March 3, 1899.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held MONTHLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by Auction of Gas and Water Stocks and Shares under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. Alfred Richards's Offices, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

SOUTHEND GAS COMPANY.

£3250 of FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, Tokenhouse Yard, E.C., on Wednesday, March 22, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Executors of the late Alfred Hammond, Esq., and other Owners.

IMPORTANT SALE OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS will Sell BY AUCTION, at the Mart, Tokenhouse Yard, E.C., on Wednesday, March 22, at Two o'clock in Lots,

STOCKS AND SHARES IN THE

Barnet District Gas and Water Company,
Ventnor Gas and Water Company,
Lewes Gas Company,
Hertford Gas Company,
Aldershot Gas and Water Company, and
West Kent Gas Company.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

£18,370 OF FOUR PER CENT. PERPETUAL DEBENTURE STOCK,

OFFERING TO TRUSTEES AND OTHERS AN INVESTMENT OF THE HIGHEST CLASS.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, Tokenhouse Yard, London, E.C., on Wednesday, April 12, at Two o'clock, in Lots.

Particulars at the HEAD OFFICES of the COMPANY, in D'Olier Street, DUBLIN; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

SAN PAULO GAS COMPANY, LIMITED.

NOTICE OF REMOVAL.

NOTICE is Hereby Given, that, on the 13th of March, the Offices of the Company WILL BE REMOVED to Nos. 1 to 4, BROAD STREET HOUSE (First Floor), NEW BROAD STREET, LONDON, E.C.

By order,
G. H. ROGERS,
Secretary.

1, Pinners' Hall, Old Broad Street,
London, E.C., March 2, 1899.

THE Acetylene Illuminating Company, Limited, 63, Queen Victoria Street, London, E.C., GIVE NOTICE that they hold the BRITISH PATENT RIGHTS for the MANUFACTURE OF CALCIUM CARBIDE by means of the electric furnace, that they are bringing an action against the Midland Acetylene (Parent) Syndicate, Limited, to restrain them from so manufacturing that product, and that they intend in the future to bring actions against all infringers of these Patents and all purchasers or users of Carbide of Calcium made in infringement of the same.

NOTICE.

THE Acetylene Illuminating Company, Limited, having published and issued an advertisement or circular claiming that they hold the British Patents for the Manufacture of Calcium Carbide by means of the Electric Furnace, we guarantee to indemnify anyone who buys Carbide from us against any claim by "The Acetylene Illuminating Company, Limited," or anyone else.

READ HOLLIDAY AND SONS, LIMITED, Acetylene Gas Engineers and Carbide of Calcium Manufacturers, HUDDERSFIELD.

NOTICE.

THE Acetylene Illuminating Company, Limited, having published and issued an advertisement or circular claiming that they hold the British Patents for the Manufacture of Calcium Carbide by means of the Electric Furnace, we guarantee to indemnify anyone who buys Carbide from us against any claim by "The Acetylene Illuminating Company, Limited," or anyone else.

TINKER AND HOLLIDAY, LIMITED, Carbide of Calcium Manufacturers, HAZELHEAD, SHEFFIELD.

TUBES AND FITTINGS
ALL KINDS
WRITE FOR PRICES
STAFFORDSHIRE TUBE Co., BIRMINGHAM.

LONDONDERRY GAS COALS
FROM THE
MARQUIS OF LONDONDERRY'S COLLIERIES,
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Available Output up to 5000 Tons per day.
Yield of Gas 11,000 cubic feet per Ton of Coal as per Analysis by
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ANALYSIS.

Yield of Gas per Ton. .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

For Prices, &c., apply to
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Coke (of good & pure quality)	$13\frac{3}{4}$ Cwt. per Ton.
Sulphur	A little over 1 per Cent.
Ash	Under 1 per Cent.
Tar	163 lbs. (Avoir.) per Ton.
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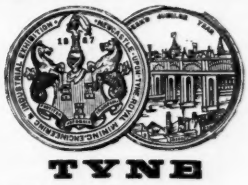

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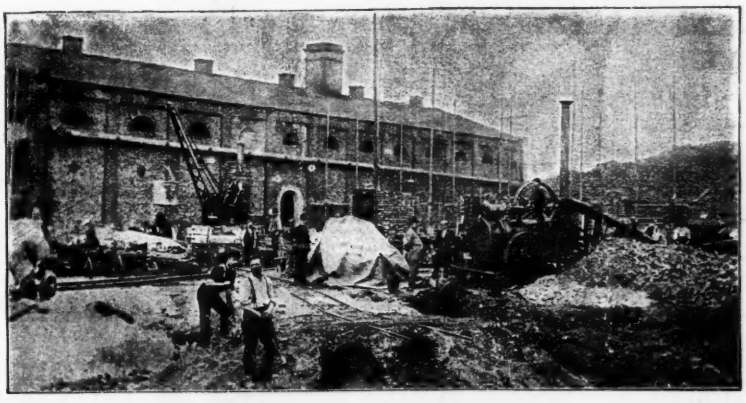

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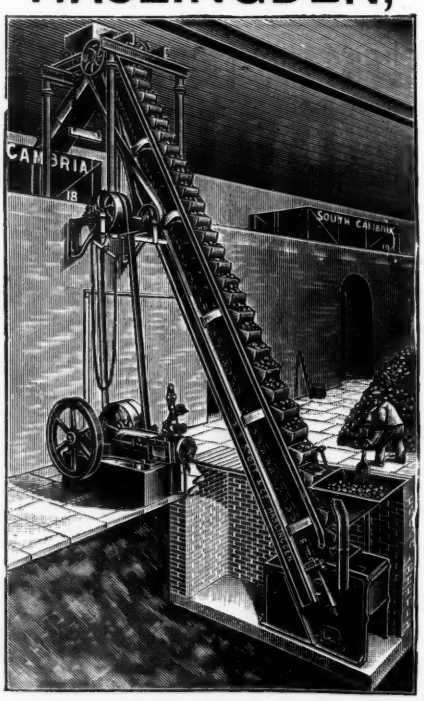

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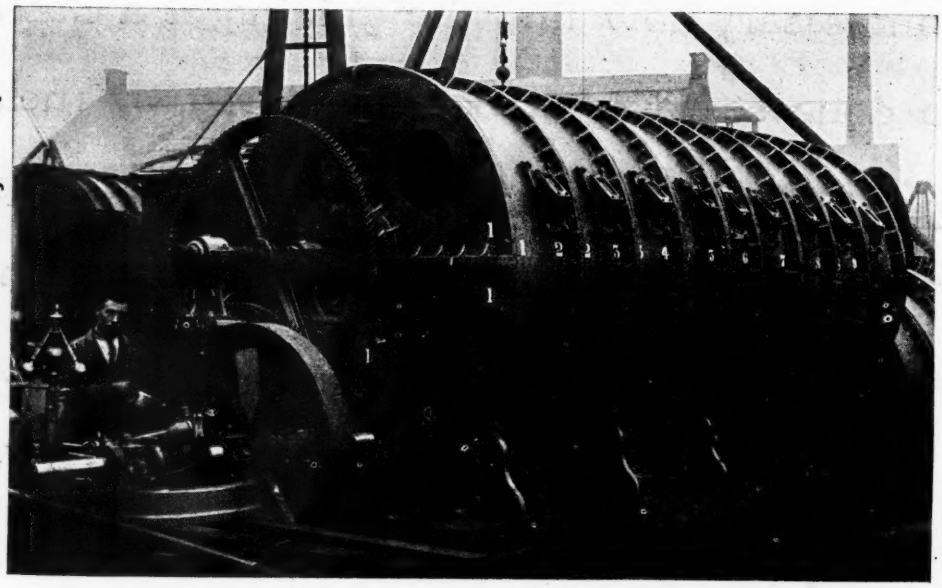

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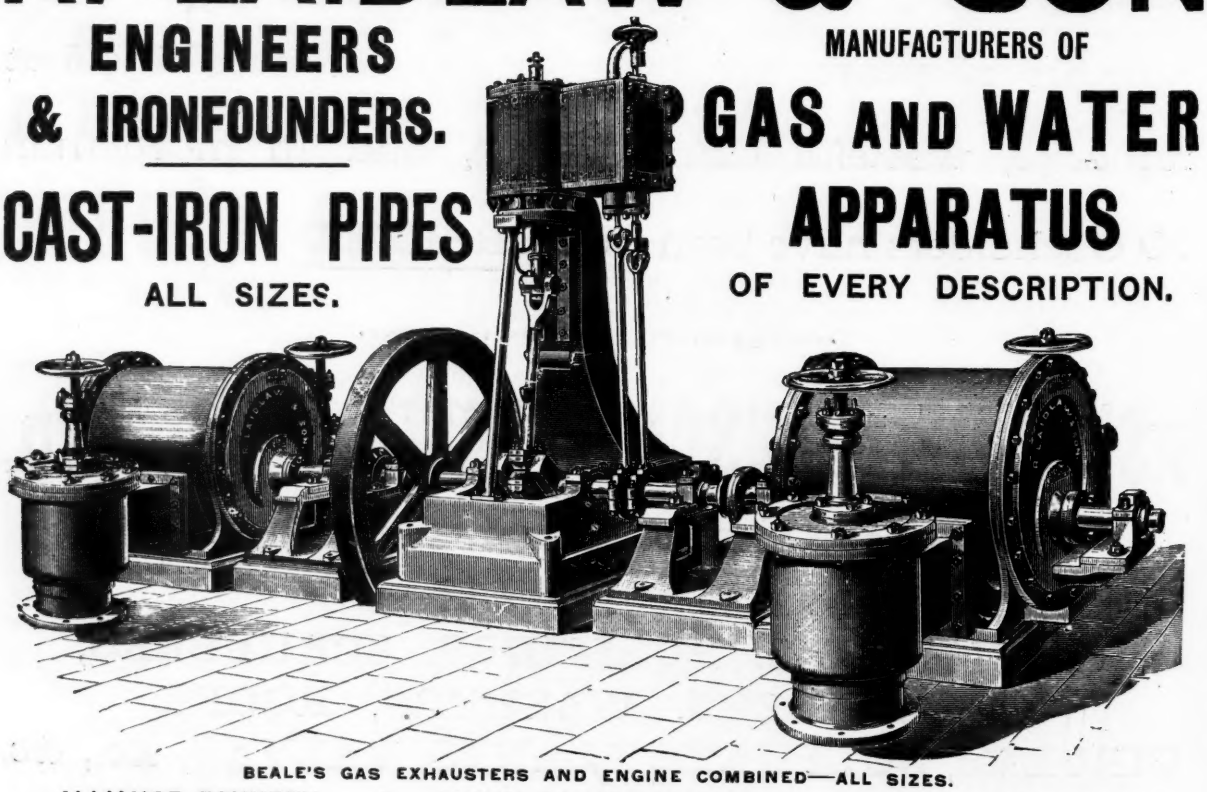

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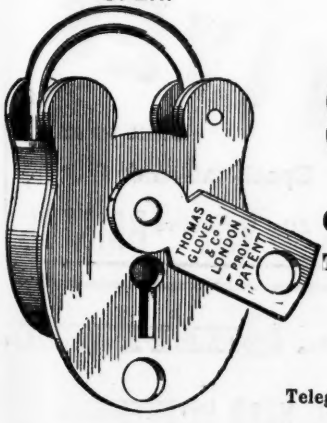

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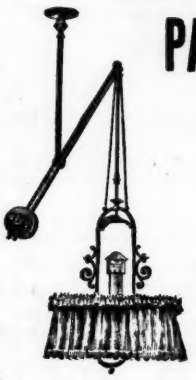

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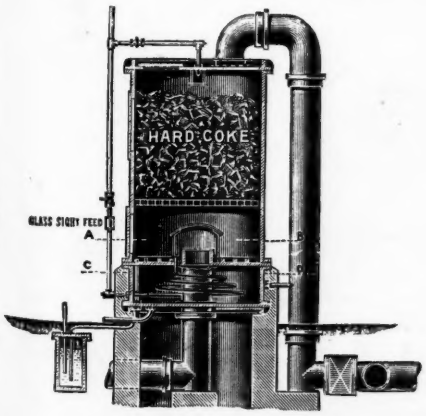

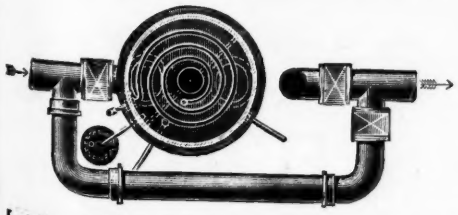

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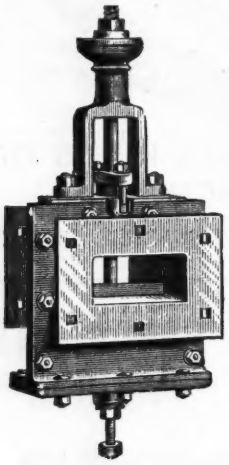

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